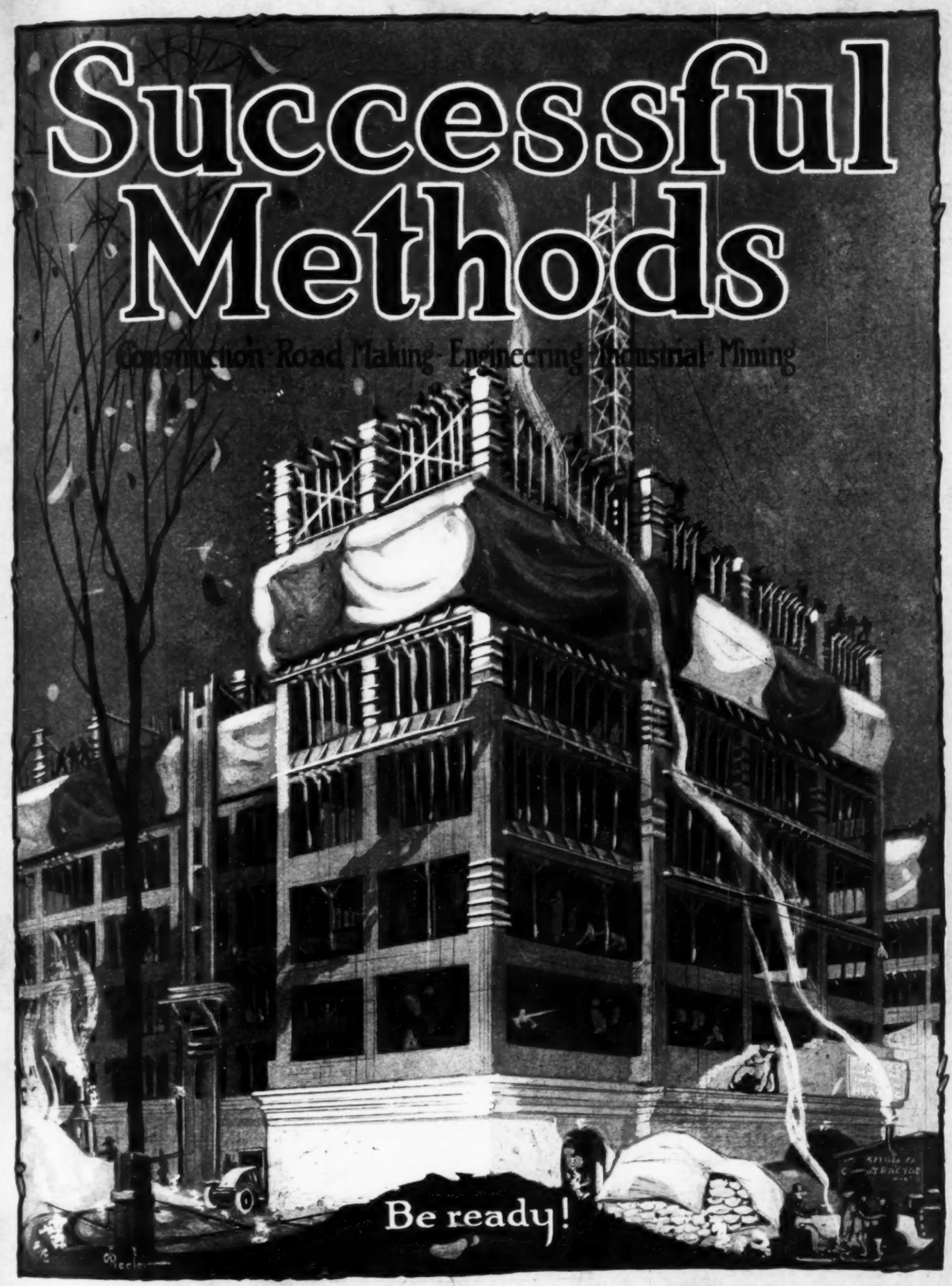
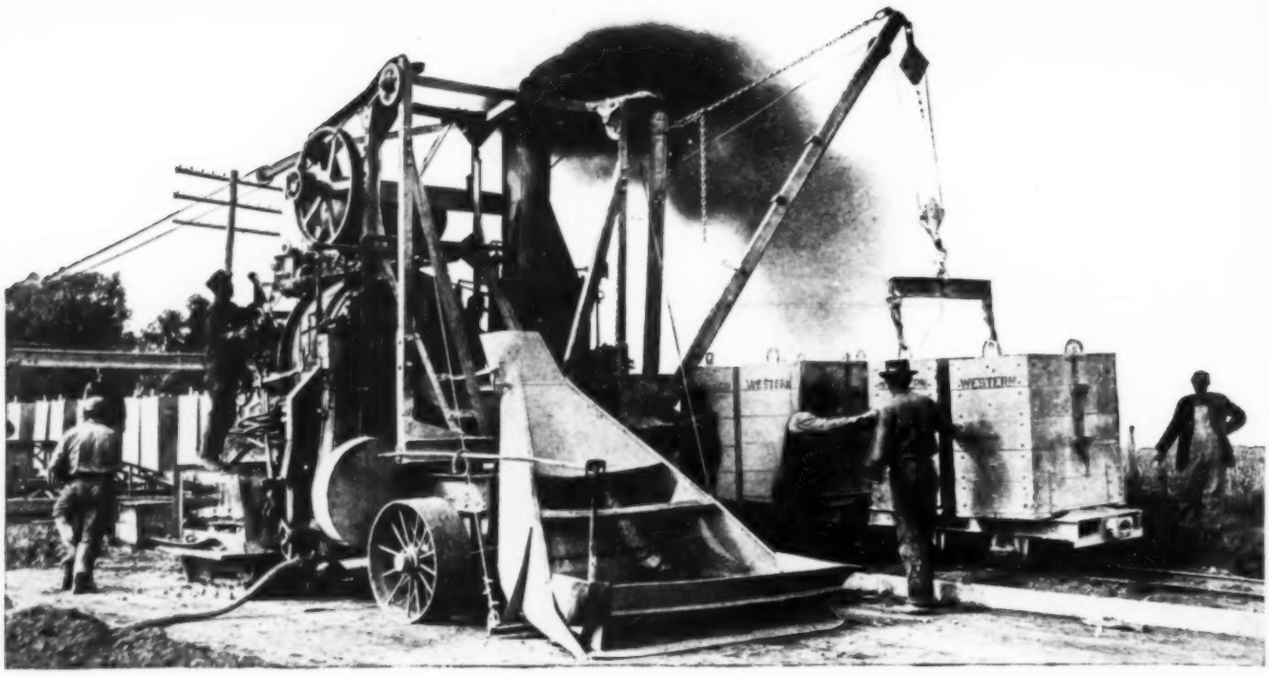
Successful Methods

Construction · Road Making · Engineering · Industrial · Mining



Vol. 2 October 1920 No. 10



Saving $32 a Day on Labor Payroll

By installing the Western Batch-Box, Industrial-Railway System on a Missouri Concrete Road job, one contractor has cut $32.00 a day from the payroll figures on which his bid was based.

Read What This New York Contractor Says

Whitney Point, N. Y., July 28, 1920

WESTERN WHEELED SCRAPER COMPANY, Aurora, Illinois

Gentlemen: We have had the Western Wheeled Industrial Railway Equipment, consisting of 24-inch gauge track, with trucks and batch-boxes, in operation for a short time here on our contract at Whitney Point, near Binghampton, N. Y. Already its reputation has spread throughout this part of the country and hardly a day passes but what contractors doing state work near by and the State Engineers in charge of the work visit us to see the efficiency of its operations. It *is* efficient, and after their visit they leave convinced of its merits.

We wish, at this time, to say that we are convinced that no state road contractor should be without the Western Wheeled Scraper Industrial Railway outfit. Our outfit is working day in and day out and each day we see an improvement as we become more familiar with its operations. Very truly yours,

[Signed] ROSOFF ENGINEERING CO., Inc., S. R. Rosoff, Pres.

You will say the same after installing the Western System. Write our Highway Engineering Department about it and get ready for the big work that is coming.

Western Wheeled Scraper Company

Earth and Stone Handling Equipment

AURORA, ILLINOIS, U. S. A.

Founded 1877

THE BEST THE WORLD PRODUCES WESTERN EARTH AND STONE HANDLING MACHINERY

EXPORT DEPARTMENT ALLIED MACHINERY COMPANY OF AMERICA

Successful Methods

A Magazine of Construction Service

Published by
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Vol. II | October, 1920 | No. 10

BE READY!

Be ready for what?

For whatever comes along. Ready for the routine duties and for emergencies as well.

The contractor whose work is shown on this month's cover did not wait until the morning of the first cold day to get his canvas ready. Winter with its alternate freezes and thaws is coming. Be ready!

Now is the time to plan how and where you are going to protect that roller, grader, mixer, and all your other construction tools.

Spring, with its new opportunities for profitable construction work, also is coming. Be ready!

Now is the time to plan the location and scope of your next season's activities. Perhaps there is a better and more profitable method of work which you may employ—a more efficient line-up of the separate units of equipment for doing your work. Why not investigate these things now? Be ready!

You'll need some new machines. Why wait until the day you want them before placing your order? The manufacturers want to help you make next season the best one you have ever had. Successful Methods suggests that you help them to help you.

Again we repeat, "Be ready!"

This Magazine Will Be Sent to Men Who Can Use It.

EDITORIALS

As Much As He Can Chew

THIS issue of SUCCESSFUL METHODS contains an article on the big road job that is just getting under way in Maricopa County, Arizona. A progressive, forward-thinking board of highway commissioners has let a contract for 278 miles of 16-ft. concrete road to a single contractor.

It is an interesting development in road building. One advantage that suggests itself at once is the elimination of competitive bidding for labor, which usually results when a flock of contractors begin to build roads in the same locality. The firm which has obtained the Maricopa job has pledged itself not to pay more than the prevailing rates in the section in which it is to work, and so will not rob the farms and ranches of much needed men. This couldn't be done if this contractor had to work in competition with other contractors on jobs only a few miles away.

Other advantages of big contracts such as this probably will show themselves as the work progresses. One thing is sure though; there is so much road building to be done throughout the United States that there is going to be room enough for all. Big and little contractors will find all they can handle, and the smaller ones who do their work well will find bigger jobs awaiting them the next year.

That's what the Maricopa job really means, the assurance that as a contractor grows in the road building business he will find bigger and bigger jobs to do. He will be privileged to bite off just as much as he can chew.

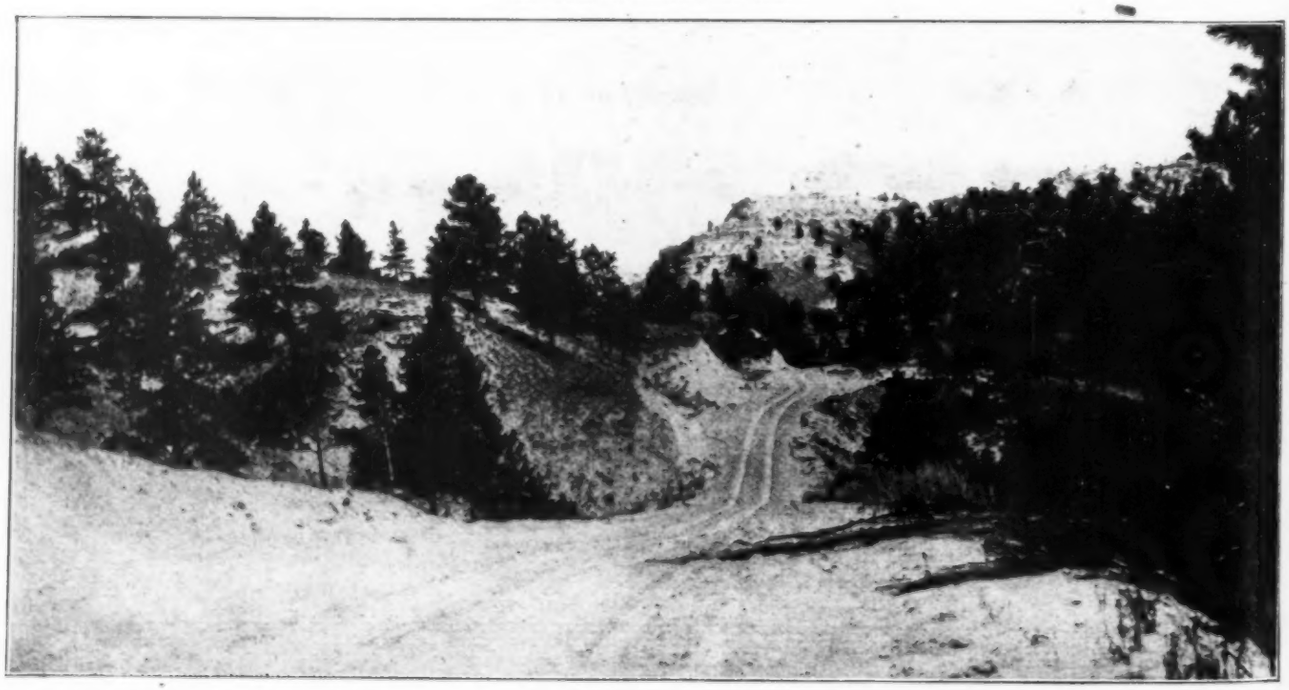
A Real State Line

IN one of Mark Twain's Tom Sawyer books he tells of a balloon trip in which the youthful hero was surprised and disappointed because Illinois was not pink and Indiana blue as they were on the map in his geography. His inability to distinguish the state lines was a severe blow.

If he were to go to a point between Van Tassel, Wyoming, and Harrison, Nebraska, however, he would find that not all state lines are wholly imaginary. At the point mentioned, a road used to cross the line between the two states without the slightest difficulty. On the Wyoming side it was a graded road; on the Nebraska side not quite so good. Nebraska decided to grade its portion of the highway and the work is now under way. But in place of following the old road a new line was selected some 100 ft. north. As a result, Nebraska's new road comes up against the line and stops about a stone's throw away from Wyoming's carefully graded highway. If no agreement can be reached between the two states, or counties, one or the other will be put to considerable expense. Either a new right-of-way will have to be bought and new grading done, or an absurd connecting link of a few feet built, with a right-angle turn at each end.

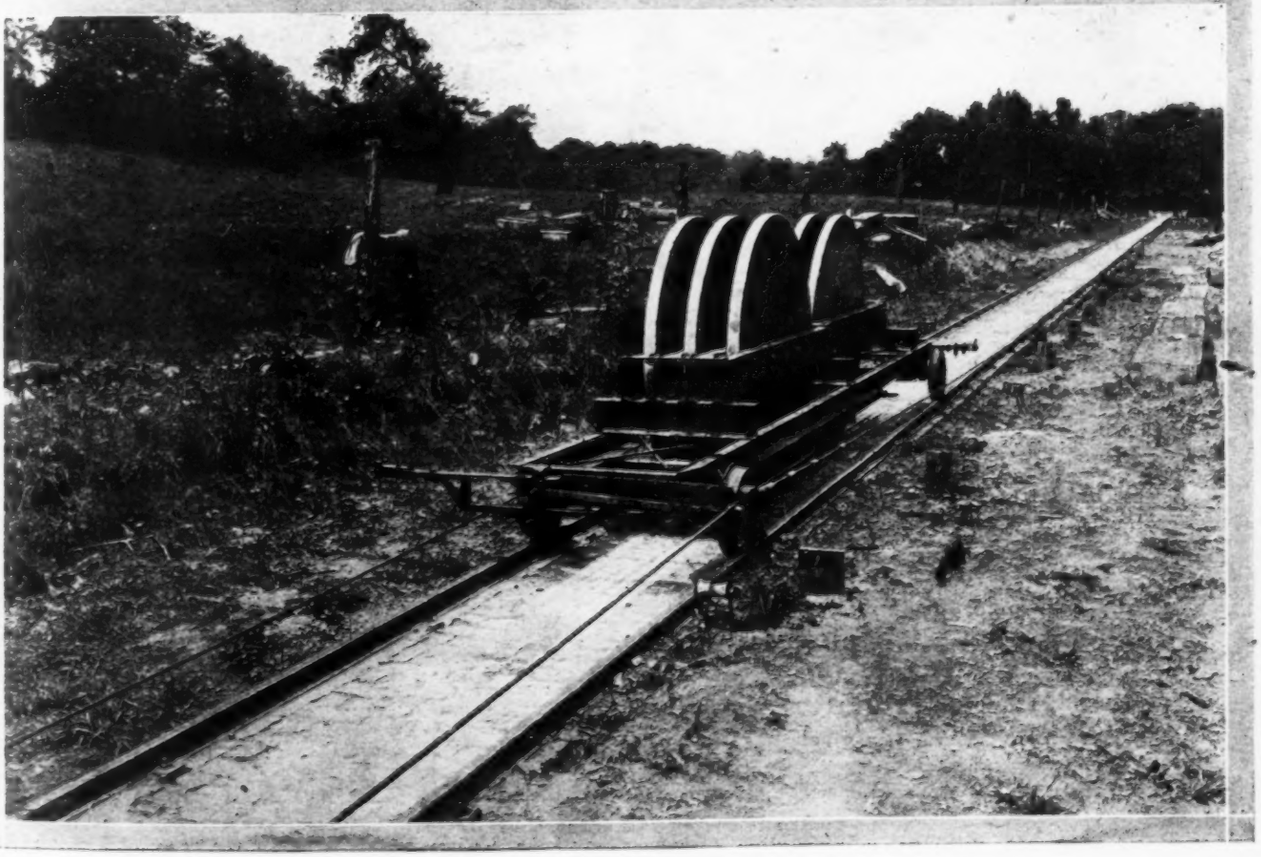
The thing is most unclubby and it seems as though Nebraska might have been a little more neighborly. After all the traveling public has some rights and privileges and it hardly seems fair to those using the roads to make a veritable barrier of a state line.

A WYOMING ROAD



TESTING ROAD MATERIALS

The United States Bureau of Public Roads is conducting exhaustive tests of road surfaces. The upper pictures show a general view and a "closeup" of the road impact machine and the photograph at the bottom of the page shows how heavy iron wheels are used to discover the weak spots in various types of surfacing.



MACHINES AND THEIR WORK

Above: Putting earth back in a trench quickly and efficiently with a back filler.

At the left: Building the Columbia River Highway—one of the tunnels in Wasco County, Oregon.

Below: Prolonging the working time on a road job in the late Autumn with an acetylene flare light.

ARE FOUND EVERYWHERE

Above: Team mates in earth moving: steam shovel and a string of wagons.

At the right: A new type of coal bin that is coming into use. It is built of concrete and looks like a grain elevator. This one is at Watertown, Wis.

Below: Two old pals in the construction machinery business: the wheelbarrow and the shovel. These are at work in the middle of Broadway, New York City.

A NEW CHAPTER IN ROADBUILDING

Maricopa County, Arizona, Undertakes Its Big Job in a Big Way

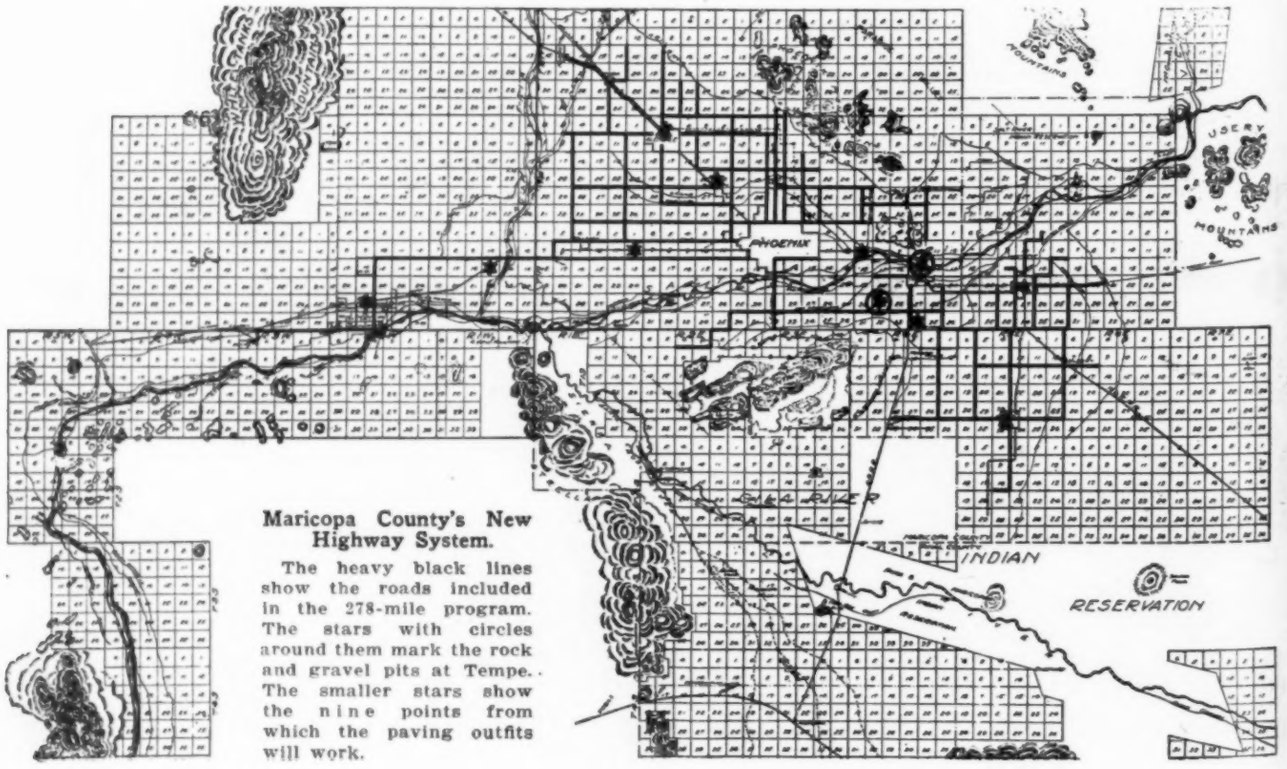
IT is a rather difficult task to write a new chapter in the chronicle of American roadbuilding. States like Massachusetts, New York, and Pennsylvania have been building and maintaining good roads for many years. Others like Michigan and Illinois have launched big state-wide construction campaigns. California's concrete roads have long been famous. All the avenues to fame in the roadbuilding game would seem to be closed.

Nevertheless, a county in one of the nation's youngest states has embarked upon a highway construction program that will make real history, and will be watched with keen interest by everyone interested in the great problem of providing the United States with adequate roads. Maricopa County, Arizona, is the writer of the new chapter. Work is beginning on a network of roads in Maricopa County which will put a concrete road within three miles of every ranch and farmhouse in the irrigated section of the Salt River valley, that stretch of country watered by the great Roosevelt dam. And the houses three miles away will be few. In most cases one one-half miles will be the longest distance from a paved highway. To accomplish this 278 miles of concrete road, 16 feet wide and 6 inches thick will be built. The job is to be finished in the short space of two years. And here is the big fact—one contractor is to do the whole job.

The people of Maricopa County, of course, are responsible for the project. They are putting up the money by bond issues and it was their realization of the value of good roads to a community that made the whole thing possible. But it isn't possible to tell much about 75,000 people except in rather general terms, so any accurate account of how the splendid program came into being must concern itself with the members of the Maricopa County Highway Commission whose photographs appear on another page. They are E. Hackett, Chairman; A. F. Jones, Secretary; P. T. Hurley, J. G. Peterson, and A. A. Carrick. C. C. Green was a member of the Commission when it was first appointed, but later was declared ineligible because he had been a member of the State Senate at the time the measure creating the Commission was passed. Mr. Carrick took his place. R. C. Perkins was appointed Highway Engineer soon after the Commission was organized and so had participated in its work almost from the start.

All of the members of the Commission are substantial business men and have been in Arizona long enough to know what that section of the country needs. Mr. Hackett, who lives in Phoenix, came to Arizona from Ohio about thirty years ago, and engaged in business as a wholesale butcher. Mr. Hurley, also of Phoenix, is a rancher and has lived in Arizona for forty years. Mr. Peterson is a rancher from Mesa and came to the state thirty-five years ago. Even the juniors of the group, Messrs. Jones and Carrick, have lived in Arizona for fifteen and nine years, respectively.

Politics didn't enter into the appointment of the Commissioners. The Board of Supervisors that appointed them happened to be Democratic, but some of the Commissioners are Republicans and as one of them said: "We never mentioned politics and we had been



Maricopa County's New Highway System.

The heavy black lines show the roads included in the 278-mile program. The stars with circles around them mark the rock and gravel pits at Tempe. The smaller stars show the nine points from which the paving outfits will work.

A.F. JONES
SECRETARY
P.T. HURLEY
J.G. PETERSON
E. HACKETT
CHAIRMAN
A.A. CARRICK
C.C. GREEN
R.C. PERKINS
HIGHWAY ENGINEER

working together for six months before I happened to find out the political leanings of a couple of my fellow Commissioners." It was a case of picking men who had proved successful in their own personal enterprises on the theory that they would handle the County's business with equal success. The result indicates that the supervisors certainly knew what they were doing.

A previous Commission, appointed in 1917, on which Messrs. Hackett and Peterson served, took the first steps. It made a report outlining a highway system of about 100 miles, but just then the war came along and relegated roadbuilding to the background. The old Commission accepted the situation, made its report, and resigned.

With the war out of the way, the demand for more and better roads was renewed and the present Commission was appointed. It lost no time in getting to work, and ever since it has worked in a manner that explains why Maricopa County is going to have 278 miles of 16-foot concrete roads within two years, and at a price that is considerably lower than that which states and counties in other parts of the country are paying.

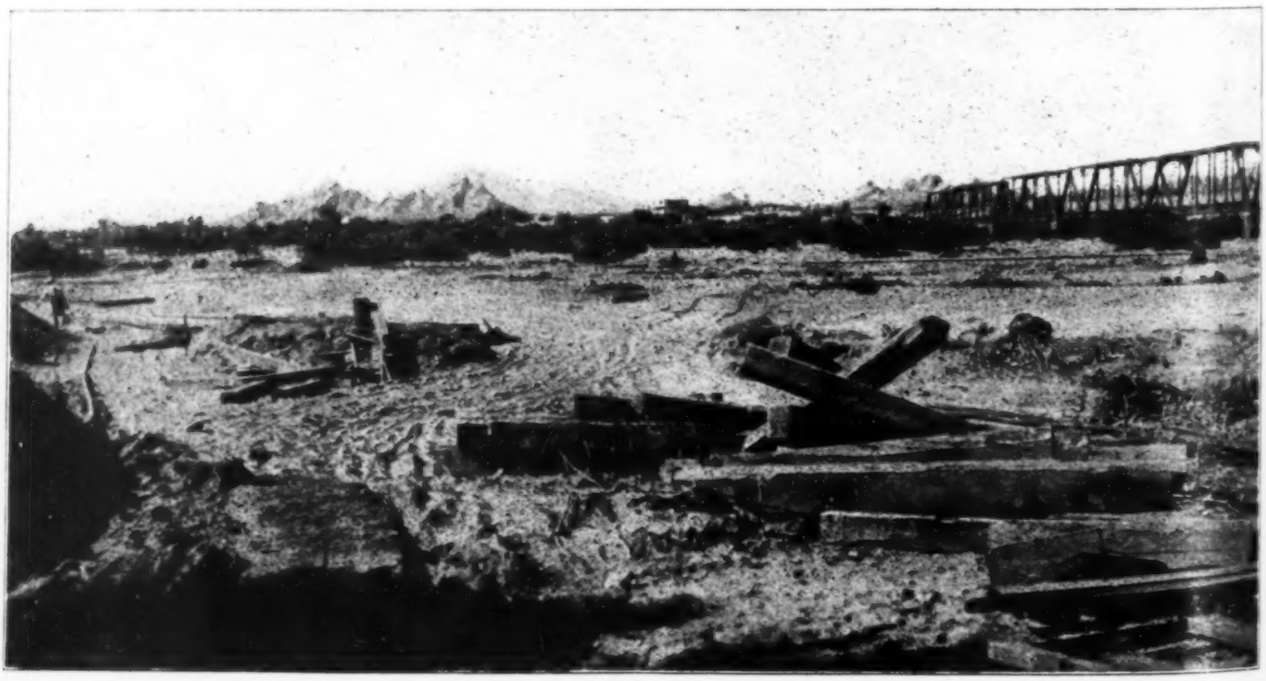
The Commissioners didn't begin with a grand splurge but settled right down to a thorough comprehensive study of the County's needs. With Mr. Perkins, they drove all over the County instead of following the all too prevalent habit of studying the road situation from the seclusion of their office in Phoenix. Nothing but first-hand knowledge was good enough for them. And they didn't confine their insistence on first-hand knowledge to discovering where to put the roads. They went after the same sort of information in regard to the kind of roads to build. Every man on the Commission has spent at least thirty days outside of the state studying roads. And at his own expense, too. Mr. Peterson went east and investigated roads in Illinois, Michigan and Minnesota. Mr. Jones spent several weeks in various parts of California, first looking at the roads themselves and then working his way through the mass of records in the County Court House to find out costs and other pertinent data. Messrs. Green, Peterson and Hurley made a trip to El Paso where they persuaded the authorities to hold up traffic while they had drillings made, and cut out 2 foot squares of pavement which they brought back to Phoenix with them for further study and analysis. Mr. Hackett went to Detroit to learn all about Wayne County's famous roads, and also spent considerable time investigating Ohio's highways.

This sort of work equipped the Commissioners in such a manner that they knew what they were talking about in the fullest sense of the phrase, when the time came to let the contract. The decisions to let the job as one contract to one firm and to build concrete roads were not the result of guesswork or snap judgments. Sober study of the situation was the controlling factor in both decisions.

But there is more to tell before discussing the letting of the contract. The first report of the Commission—it must report every six months—outlined the 278-mile program before referred to, but recommended roads of varying width and thickness depending upon the needs of traffic in the different localities. A bond issue of $4,000,000 was passed by the people of the County by a 14-to-1 vote to finance this program.

But the people were not satisfied with the first plan. They wanted something better and the Commission began to hear from civic bodies and individual citizens throughout the County. "Make the roads all of the same width" was the demand, and as that was just what the Commissioners themselves wanted to do, they began a revision of their plan.

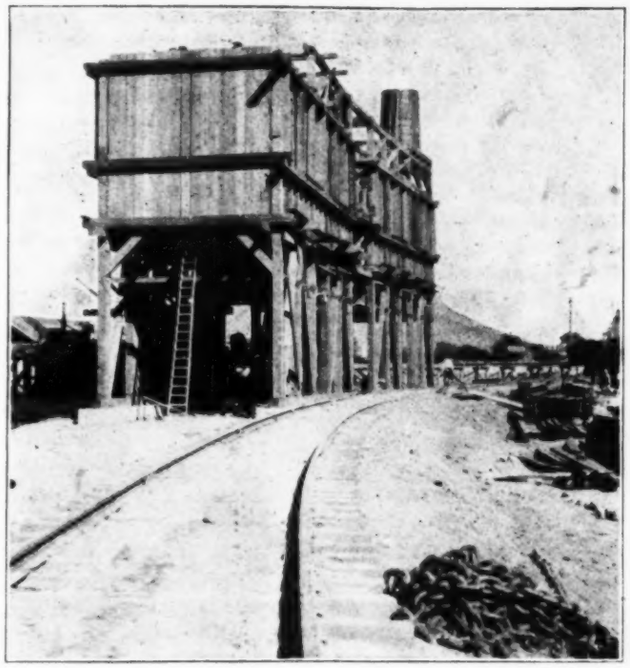
Among its other activities the Commission worked out a plan for a centrally located gravel pit in the bed of the Salt River at Tempe. Some land was bought from the state and 80 acres in the river bed were leased. At first the Commission planned to run its own gravel plant and supply materials to the contractors building the roads, and in pursuance of that plan made an agreement



THE PIT IN THE BED OF THE SALT RIVER AT TEMPE FROM WHICH ALL THE SAND AND GRAVEL WILL BE OBTAINED FOR THE ENTIRE PROJECT. A STRIKING EXAMPLE OF THE HIGHWAY COMMISSION'S FORESIGHT.

with the railroads for transportation which still holds good and will save about $500,000 for the taxpayers. Plans for operating a cement plant also were considered, but in order to be sure of its ground before going ahead, the Commission arranged for the bringing of two friendly taxpayer's actions to test its powers. The State Supreme Court decided that the Commission was not empowered to carry out its operating plans, and they had to be abandoned.

This all took time, but it was time well spent. Lawyers whose advice had been sought, differed on the question and the only safe thing to do was to let the Supreme Court decide it once for all.



THE CRUSHING PLANT AT TEMPE.

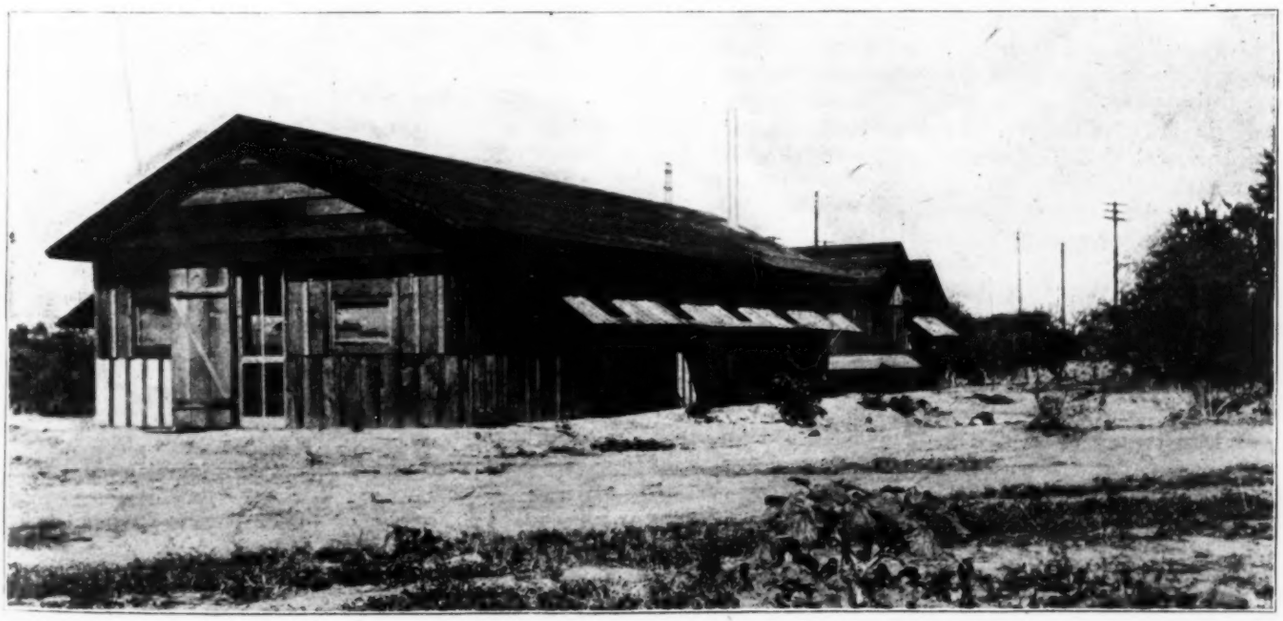
When all such mooted questions had been settled, bids were called for. Bidders had the option of bidding on the project as a whole or on separate parts. The type of road also was not specified in order that the makers of various types could have every opportunity to advocate the adoption of their types from both the standpoint of economy and quality.

Getting a bid on the job as a unit proved a difficult proposition. The big contractors didn't want it on a lump-sum basis. One attractive bid on a cost-plus basis (cost plus 6%) was received from a big California firm of contractors, and was carefully considered. The Commissioners had worked out a plan for checking the job if done on a cost-plus basis that would have protected the County's interests at every turn. But under the act creating the Commission the acceptance of a cost-plus bid was impossible, so the Commissioners regretfully turned down the bid received, and called for new offers.

The opinion that the job ought to be let as a unit grew upon the Commissioners and the question finally settled down to a choice between bitulithic, (black roads as they are commonly called in that section), or concrete. One bid for the whole job on a bitulithic basis was received, and another for concrete. In addition there were several bids on separate sections but in each case they were higher than the average price on the unit bids.

Concrete won. The Commissioners had seen enough in their travels to persuade them that concrete was what they needed if they could get it at a price that would be fair to the contractors. And they did. Twohy Brothers, known throughout the Northwest as big railroad contractors, and during the war as shipbuilders as well as contractors, put in a bid that will give Maricopa County its 16-ft. concrete roads at an average price of only $28,000 per mile.

The acceptance of its bid put the responsibility squarely up to Twohy Brothers, and that big organiza-



ONE OF THE MODERN MESS HALLS AT THE BIGGEST TWOHY CAMP. SCREENED ON ALL FOUR SIDES AND FLOORED WITH CONCRETE.

THE TWOHYS MEAN BUSINESS. THEY HAVE HIRED THIS HOUSE IN PHOENIX FOR THEIR MAIN OFFICE.

tion at once began to make its plans for the carrying out of the biggest single contract in American highway construction. What has been done thus far, and how the work is to be carried on will be described here briefly, and in subsequent issues after the actual paving has begun, SUCCESSFUL METHODS will keep its readers in touch with the progress of the work.

From start to finish the work is to be done by machinery, and the most modern methods of building roads with machines have been adopted. At the gravel pit at Tempe the crushing and screening plant has been put up. The material will be loaded into cars with a steam shovel, and hauled to the crusher beside the pit, where it is crushed, screened and washed. And here is an important point. From the time the aggregates are washed, they never are allowed to touch the ground until they emerge from the mixer as concrete. This means clean aggregates and, as a result, better concrete.

This result is accomplished by discharging the washed sand and gravel into standard-bottom dump railroad cars which take it to the paving units or setups. Two of these units will be in operation continuously. Each will consist of trestle bins for sand and gravel into which the bottom dump cars will discharge their contents. From these bins small tipover batch cars will take the aggregates to the pavers over narow-gauge track. The cement is to be shipped in bulk and unloaded from the railway cars and loaded into the batch cars by a vacuum system. Gasoline locomotives, pulling eighteen-car trains, will take the aggregates to the pavers which in no case will be more than eight miles from the setup.

Because of the nature of the soil little grading will be necessary. It probably will not be more than 1,000 yards to the mile. Plows, blade graders and scarifiers will do what there is to be done. Rollers and subgraders will prepare the way for the pavers, and finishing machines will complete the work.

In a typical setup, one paver will begin work about seven miles away from the setup and the other only about half a mile away, both working toward the setup. This method will get the work done with the minimum mileage of track.

Gasoline is to be the motive power for all of this equipment. Even the pavers are to be operated by gas, the first time pavers of this size have been constructed with gas power.

The map on page 6 shows the nine places at which the setups will be located. These places were selected by the Highway Commission and, of course, each of them is on the railroad. The problem of obtaining water is a simple one because of the many irrigation ditches which in many cases parallel the roads which are to be constructed.

Each setup will include 2 pavers, 8 miles of track, 6 locomotives, 100 cars, 2 rollers, 2 subgraders and 2 finishers in addition to the fixed equipment. Steel forms will be used. It is expected that about 60 men will be required for each setup, and the total number of men on the job, including both paving setups and the gravel plant, will not be more than 200. While two setups are in use a third one will be under construction. Provision has been made for nine of them in various parts of the County.

Each paver is expected to put down 2½ miles of road per month until next spring when the working time will be increased to 16 hours per day by the use of two shifts.

Twohy Brothers are used to big jobs. They know how to handle men and machines. Their skill in handling men is demonstrated by the camps they are building at the crushing plant and other points. Concrete floors for mess halls and kitchens, buildings open on all four sides, but carefully screened, everything possible done to make the camps pleasant places in which to live. The administration end of the job is conducted from a former residence on Central Avenue in Phoenix, and in offices at the various camps. John Twohy and James Horan, the General Manager, are planning to live in Phoenix until the work is done. Twohy Brothers realize their responsibility to the people of Maricopa County, and they are going at the work in a fashion that spells success.

Wherever roads are being built, and that means everywhere in the United States at least, the progress of the Maricopa County job will be followed with the keenest attention. The size of the project, the short space of time in which it is to be completed, the letting to one contractor, the use of so much machinery, and finally the character of the County Commissioners who planned it, and the contractors who are executing it, all help to make Maricopa County's chapter in highway building an absorbing story.

MORE EVIDENCE THAT THE WORK IS TO BE WELL DONE. ONE OF THE FIELD OFFICES.

CONVEYOR GETS OUT SILICA SAND

Illinois Company Loads 50 Tons an Hour With Only 4 Men to Operate Plant

OPENING a silica sand pit always has been a rather tedious and expensive operation. Men, horses, scoops, wheelbarrows, bins for storage, often have been used in order to get the sand from the pit into the cars.

GENERAL VIEW OF PIT

The South Ottawa Silica Sand Company, near Ottawa, Illinois, is opening up an extensive pit with a drag line and belt conveyor which puts the sand into the cars without immediate storage and extra handling.

Water usually is reached at a depth of about 40 feet, and, from that point on, hydraulic pumps are used to get out the sand. The drag line and conveyor are being used to get out the sand above the water level with a minimum expenditure of time and labor.

DISCHARGING SAND INTO HOPPER

The three photographs on this page show how it is done. The equipment consists of a 24-inch conveyor, 95 feet in length, driven by a 15-horsepower tractor, and a 4-ton drag line, operated by a steam engine. A special hopper, designed by Mr. Cebulske, the owner of the works, completes the outfit. When the conveyor was first installed, it was 85 feet long, and since then a 15-foot section has been added. As greater depths are reached, the conveyor can be lengthened again.

In the first photograph, a general view is presented which shows clearly the depth of the pit. The middle photograph shows the bucket at the top of the incline, ready to discharge, with the hopper and the belt empty. In the third photograph, the belt is loaded all of the way from hopper to car, while the bucket has gone back for another load.

With this equipment, four men can load a 50-ton car in an hour. One man fires the boiler and also operates the cable winches. Another tops off the car and pinches it along the track. The other two men are in plain sight in the photographs. They stand at the hopper and keep feeding the material to the belt. Only one man would be needed at this point were it not for the fact that the sand is damp and there are occasional soft lumps which have to be broken up.

Although the conveyor is of a permanent type, in that it is not equipped with wheels, it is so mounted that it can be moved on skids in a comparatively short time. This makes it possible to open up the entire pit by shifting the outfit whenever the water-level is reached where it is working.

There are about 28 silica sand pits in the neighborhood of the one described, and not one of them is getting out its sand more economically or efficiently than the South Ottawa organization. The sand in this particular part of Illinois is of extremely good quality and is in constant demand by glass factories, foundries, etc. For sheer efficiency and ease of operation, Mr. Cebulske is willing to back his outfit against that of any of his neighbors.

BELT LOADING CAR

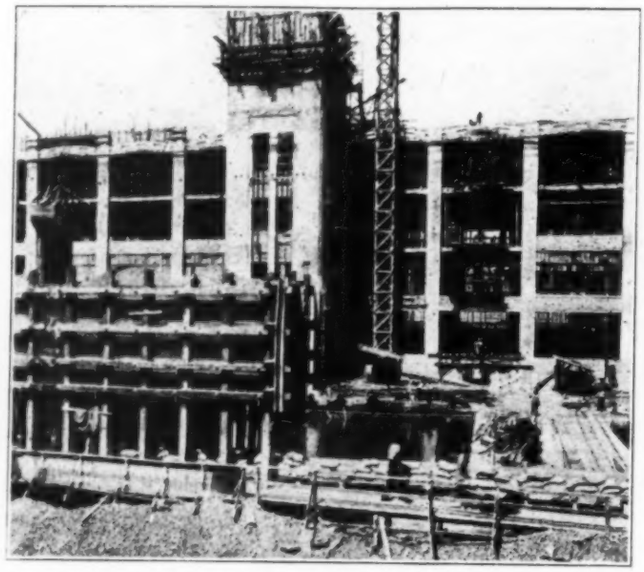
It is simple, does its work well and can be moved easily whenever it finishes work in any one place. These qualities, combined with the saving of labor in these days, when labor is so hard to get, make the outfit just what is needed for the job. Its total cost also is much less than that of the bigger plants with extensive bins for storage, and other apparatus.

CANAL COMPLICATES CONSTRUCTION

Small Cars Solve Problem and Carry Concrete Across Bridge From Mixing Plant to Towers on Job at Danville, Va.

By Jack Cozine

THE problem of putting up a new four-story building 840 feet by 144 feet and containing 39,000 cubic yards of concrete, for the Riverside and Dan River Cotton Mills, Inc., at Danville, Va., was complicated considerably by the presence of a canal 78 feet wide, close to the site selected for the new building. The Aberthaw Construction Company, which is doing the work, had to plan the layout of its construction plant in such a way that the canal did not interfere with efficient operation.



CEMENT SACKS ON THEIR WAY FROM STOREHOUSE TO MIXER

It was found that there would not be sufficient room between ths bank of the canal and the walls of the building to install the mixers and it was found impracticable to chute the concrete across the canal, although that plan was first considered.

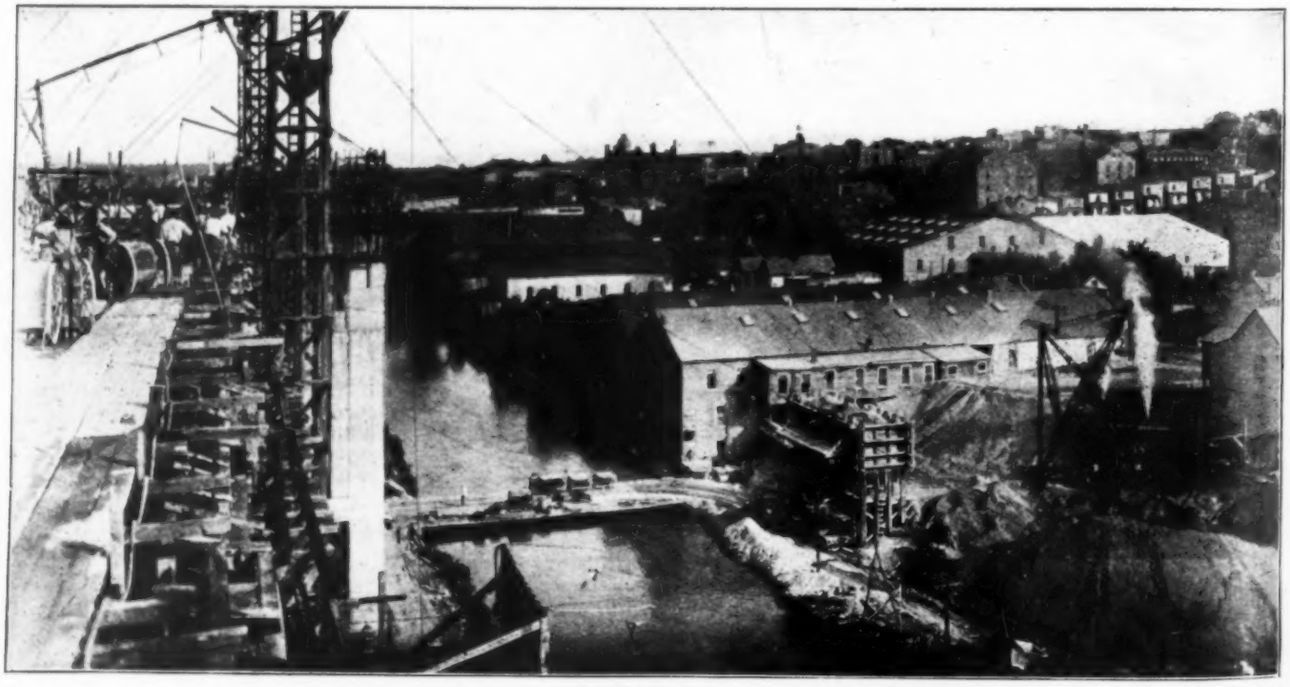
The problem was solved by constructing a bridge across the canal, mixing the concrete on the farther bank and carrying it across the bridge with industrial cars. The photograph on this page shows the general layout.

The sand and gravel are delivered by railroad cars to specially constructed bins under a railroad trestle about one-fourth of a mile from the job. From these bins the material is hauled to the bank of the canal in five-ton trucks and dumped. A stiff-leg derrick with a 70-foot beam and a 1½-yard clamshell bucket located between the gravel and sand piles is used to get the materials into the mixing plant on the bank of the canal. This plant consists of two four-bag mixers and overhead charging hoppers of 350-yard capacity.

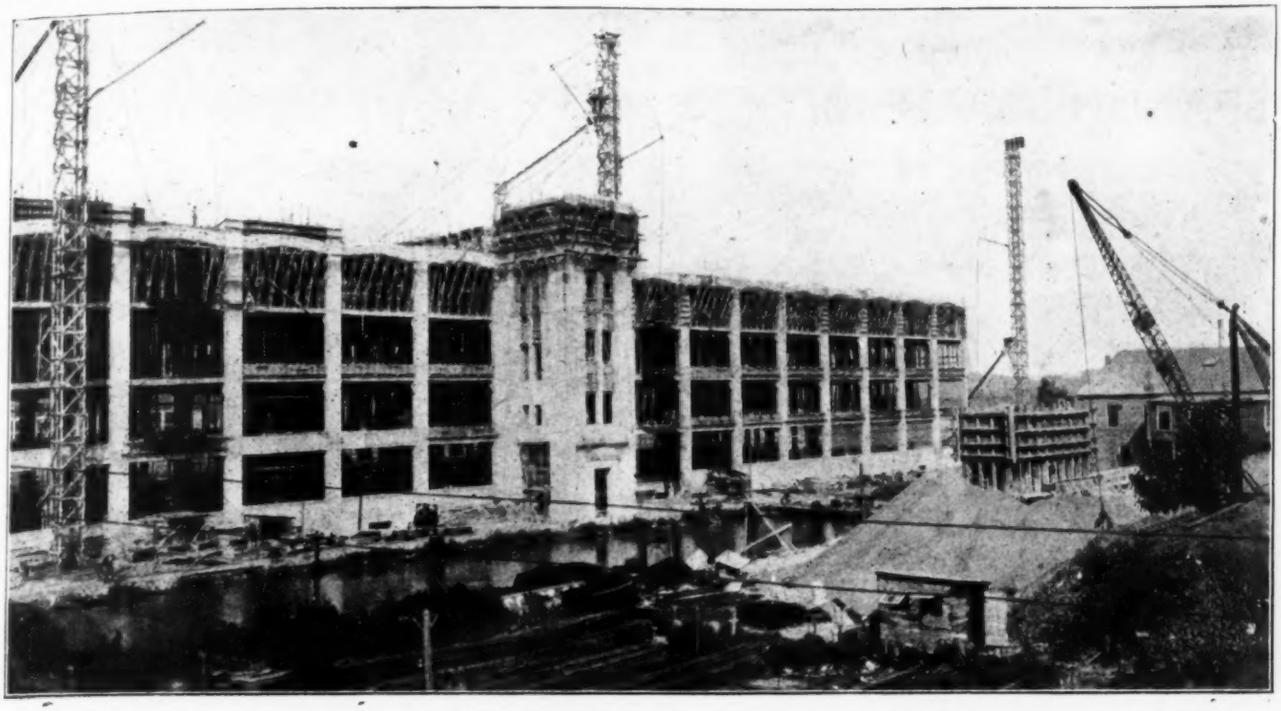
Specially constructed charging hoppers under these bins measure the material and discharge it directly into the mixers. The cement is stored in a brick house which is shown in one of the accompanying photoraphs and is delivered to the mixing platform by gravity on roller conveyors. The bags of cement passing to the mixer on one of these conveyors may be seen in another of the photographs.

In order to operate the mixing plant fourteen men are needed: one man at each mixer, four on the charging platform, one man each for sand, gravel and cement on each mixer and a fireman and engineer on the derrick.

From the mixer to the job the concrete is trans-



THIS PHOTOGRAPH SHOWS THE LAYOUT OF THE CONSTRUCTION PLANT.



A GENERAL VIEW OF THE NEW MILL SHOWING THREE OF THE TOWERS. THE STOCK PILES ARE PROMINENT IN THE RIGHT FOREGROUND.

ported in three and four car trains of tip-over cars operating on a double track of industrial railroad which runs in front of the mixing plant, across the bridge, and the full length of the building. These trains are hauled by a three-ton gasoline locomotive to four towers 150 feet high, from which the concrete is distributed through chutes.

Since operations were begun, the amount of concrete placed daily has averaged 350 cubic yards for each ten-hour day and has run as high as 450 cubic yards when two towers were used.

The total number of men in the concrete crew including those employed in mixing, transporting to towers and placing concrete on floors consists of 32 men. Beginning with the first floor two bays were poured across the building daily without interruption.

A TRUCK AND A STEAM SHOVEL

By Daniel J. Hauer, C. E.
Construction Economist

RAPID moving of a steam shovel across country was recently accomplished in St. Mary's County, Maryland. A contract for 6 miles of road construction was let in the fall by the State Road Commission with heavy grading upon it. A steam shovel was needed for the excavation, but it was necessary to carry the shovel 29 miles from the railroad.

To carry the shovel under its own power meant from 3 to 5 days' time with considerable cost. One man offered to deliver it to its destination with a tractor for $300.

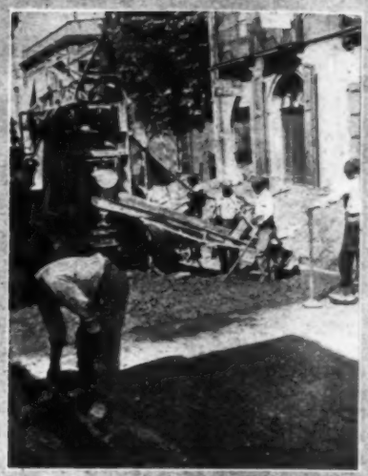
The contractor decided to use another method. He hired a 5-ton truck. The steering gear was taken off and the shovel and the rear axle of the truck were connected by means of two short link ¾-in. chains, one fastened on each side. A space of about 5 ft. was left between the bodies of the two machines. The boom was swung to the center and the dipper dropped into the bottom of the truck body. Steam was kept up on the shovel to assist the truck in going up hills.

The shovel engineer went ahead of the truck in a pilot car, coming back to run the shovel up the hills. The first day's run was mostly over bituminous macadam roads and the second day was over gravel and dirt roads. The start was made at 9:30 o'clock in the morning and by 8 o'clock that evening the shovel had covered 18 miles. The next day the shovel was under way at 7:30 o'clock and made the remaining 11 miles by 3 o'clock that afternoon. By nightfall it was placed and ready to dig dirt.

The entire cost, including the truck hire, its return to its owners and the wage of engineer and one other man, was less than $100.

This method has been used to move shovels over smooth streets in cities, but the use of trucks for moving shovels in the country for long distances has not been recorded in many cases. O. F. Terry Co., the contractors, have set a new record by their rapid pace of 29 miles in less than two days.

SPANISH ROADBUILDERS WITH MODERN MACHINES



How the Work Was Done

The three upper photographs show the American paver at work in the narrow Spanish street. By swinging the carrier only 45° the whole of the road was covered. Note the baskets used to charge the mixer. Evidently labor is not as expensive in Spain as it is here. In the lower photograph the method of ponding is shown at the left, and the finished road with its neat curb at the right.

AMERICAN MACHINES BUILD ROADS IN SPAIN

Citizens of Moncada Prove That They Appreciate Their New Concrete Highway

By B. Prichard

THE great increase in motor traffic is by no means confined to the United States. Over in Spain the big trucks have been playing havoc with roads and the need for hard surface highways is making itself felt.

The first concrete highway constructed in Spain by modern machinery has just been completed in the town of Moncada, which is close to Barcelona. American machinery was used. The road is 650 meters in length, 5½ meters wide and the average thickness of the concrete is 20 centimeters. In American measurements these figures would be approximately 2,132 ft. in length, 18 ft. wide and 8 in. thick. Expansion joints are used every 12 meters and gutters are cast at the edge of the road. The engineers in charge of the job were Messrs. Tomlinson and Soler of Barcelona.

The completion of the new road was celebrated in splendid style by the people whom it will benefit. An account of the inauguration, written by R. G. Matthews, an American engineer who was present, follows:

"The Inauguration Ceremony was supposed to start at about 3:00 or 3:30 in the afternoon. In the village court room the reception and speeches were given and a couple of long tables with different wines, pastry and sandwiches were set. Everything was in readiness to begin the ceremony at the appointed time, but the Minister of the Interior, the Governor of Barcelona and the Bishop of Urgell, Prince of Andorra, had not arrived and of course it was impossible to start the ceremony until after their arrival without appearing discourteous.

"We decided that as long as it would be necessary to wait some time we would take a look at the new road. In walking over it we found some flaws in comparison with roads made in the States but all things taken into consideration we felt that it was very good for the first attempt. We learned afterwards from the engineer in charge that considerable difficulty was experienced with the cement due to the fact that it was not seasoned before it was used. This caused considerable trouble when surfacing and they were not able to obtain as even a surface as is general in concrete road construction.

"If it had been possible to obtain a regular finisher instead of the makeshift affair used the surface would have been improved considerably.

"The town officials and the other authorities who inspected the road are well pleased with it. It certainly has caused a lot of comment and interest. With the present methods even without using an entire outfit of modern equipment a road can be made at a saving of 12 pesetas a meter over using granite block. This means that the cost is reduced about 35% and the saving in time is much greater.

"At about 5:30 o'clock the Minister of the Interior, the Governor and the Bishop arrived. Everyone was then presented to them and as each person was presented to the Bishop, kissed his ring. After that the Governor and the Minister of the Interior went out on the balcony of the court-house and watched the people in the street. After a while everyone adjourned to the reception room again where the wine, sandwiches and pastry were consumed.

"The Bishop was waiting at the church for the procession to begin and consequently everybody went over there to start with the procession. First came the little girls and boys with candles, then the older girls and women and the men all with candles lighted, then the town band and behind them, the Minister of the Interior, the Governor and the Mayor of the town. After these came the remainder of the town officials, then a Red Cross Band from Barcelona, the Bishop with two other priests one on each side of him and a canopy over their heads carried by four choir boys. Around this party was a cordon of rural guards as an escort and at the end of the procession the townspeople. The procession marched over the new road and back again to the church where it broke up. When the procession arrived in the center of town there was a regular Fourth of July celebration caused by fire crackers hanging by a rope strung along the center of the street. These were exploded as the principals of the procession marched underneath. This ended the inauguration ceremony."

LONDON LIKES YANKEE PAVER

AFTER giving service for 60 years the roadway in Oxford Street between the Circus and Tottenham Court Road, London, is being re-laid and American machinery is doing the work.

The old foundation was put down at a time when traffic averaged about 4 tons at 4 miles per hour and today on that particular stretch of road the average is nearer 20 tons at 20 miles an hour.

The work began the latter part of July and is expected to take at least 4 months to complete. A concrete foundation will be laid which will be covered with creosoted Swedish deal blocks. Puget Wellington, the Marylebone Borough surveyor, who is directing the work, told a reporter for the *London Daily News* that the new road would not have to be touched for 100 years.

The American paver attracted considerable attention. It is operated by 13 men who do the work of 60 men under the old methods used in London before the advent of the new machine. It also mixes the concrete in such a manner that it sets in a shorter time than when mixed the old way, which is of great advantage in the fickle London climate.

For the surfacing 600,000 wood blocks will be used and the entire job will cost between £40,000 and £50,000 or in the neighborhood of $200,000. Just as they have in the United States, the prices of labor and materials in England have gone up since the war.

KEEPING AHEAD OF THE GAME

By Delivering Materials on the Roadside in the Fall, Maryland Speeds Up Its Maintenance Work in the Spring

By John N. Mackall
(Chairman Maryland State Roads Commission)

ROAD maintenance, if it is to be efficient, and satisfactory, must be constant. "Eternal vigilance" may be the "price of liberty", but most assuredly, it is the first and foremost thing in any maintenance program.

Maryland has about 1100 miles of waterbound macadam, shell and gravel roads, which cost from $3,000 to $7,000 per mile for the gravel and shell, and from $6,000 to $12,000 for the macadam. Under its system of maintenance, these roads are carrying a tremendous amount of traffic, and when interest, depreciation and maintenance costs are figured, it will be seen that they are carrying it at a very low cost.

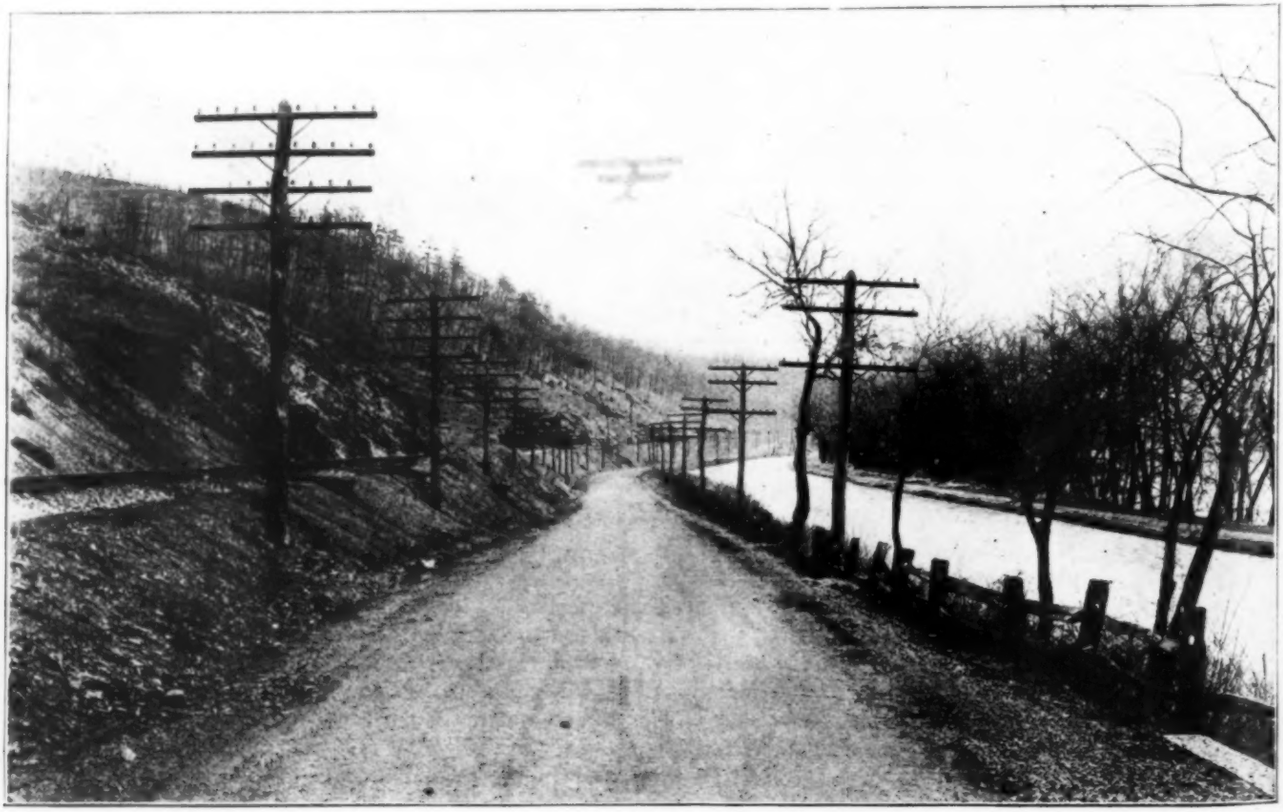
The writer is convinced that no type of road can be maintained without the patrol system. It is sometimes necessary to supplement the patrol system with a gang, but roads only can be properly maintained with constant attention, which the patrolmen alone can give.

Following this to a conclusion, the patrolmen must be supplied with materials close at hand, to meet any emergency which might arise, or to aid in case the system should break down. Material for spring patching, must be delivered in the fall or summer, so as to be on hand when needed. This was thoroughly demonstrated in this State last year. The winter was the most severe on roads ever known, because of the excessive amount of hail, sleet and snow.

A track for motor cars and trucks was easily made through the hail, which was about 8 to 10 in. deep, and as the hail became compacted from thawing and freezing and from additional snow and sleet, no more tracks were made, so that for two months, all traffic was confined in a single track. Trucks and cars, under such weather conditions, invariably use chains, which add materially to their destructive action. Under this traffic, shallow ruts were made in practically all the macadam, both waterbound and bituminous. In some cases, these ruts wore through the surface treated course only but some were much deeper.

Had not stone and bituminous materials been available to start patch work immediately when the ice disappeared, these roads would have suffered tremendous damage sooner. Some of them would have been damaged to the point of destruction. As the materials were available in two weeks after the ice left, the ruts had all been patched, and in a month the roads were again in perfect condition.

The writer desires to emphasize the fact that without the patrolmen, this could not have been done, and without having the material previously delivered, the patrolmen could not have functioned. During that particular season, no stone could have been acquired, because no quarries were operating and even if they had been, it



FIVE MARYLAND HIGHWAYS IN WASHINGTON COUNTY—WESTERN MARYLAND RAILROAD, STATE ROAD, CHESAPEAKE AND OHIO CANAL, POTOMAC RIVER AND THE U. S. AERIAL MAIL.

THROUGH THE MARYLAND MOUNTAINS.

would have taken considerable time to have delivered the stone to the point where needed. Then to have hauled heavy loaded trucks over these roads in that condition would—to say the least—have done them no good.

On the gravel roads this was particularly true. Material, which is obtained locally, could not be hauled, because of the soft condition of the road, so that only material previously delivered, was available.

Incidentally, any bituminous materials which will not stand freezing have been discarded without consideration by this Department as unsatisfactory for patching, regardless of their other qualities as it is necessary to be assured that any material available is satisfactory.

WHITEWASHED POLES MARK THE STATE ROADS.

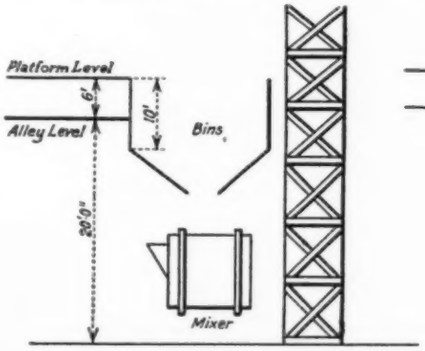
NO REST FOR THE MIXER

Properly Planned Layout Adds to Efficiency of Job at Pocatello, Idaho

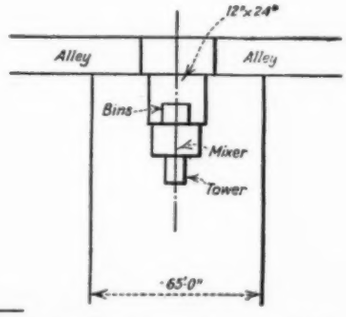
GETTING materials into the mixer in the most efficient manner, which is another way of saying with the least amount of handling, is the desire of every contractor working with concrete.

In building the first three units of the Hotel Bannock of Pocatello, Idaho, the Lynch-Cannon Company of Salt Lake City, Utah, planned a layout for delivering material to the mixer which worked in a satisfactory fashion and effected a considerable saving.

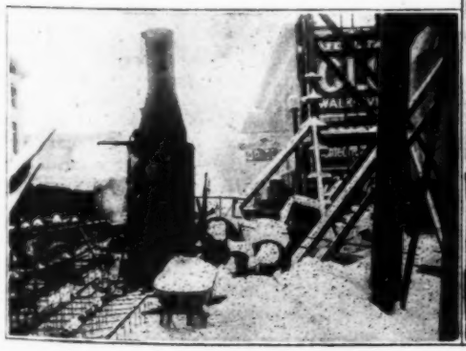
The mixer was placed in the cellar of the new building, which was about 20 feet below the grade and the aggregates were brought to it



Elevation showing how bins and mixer were set up.



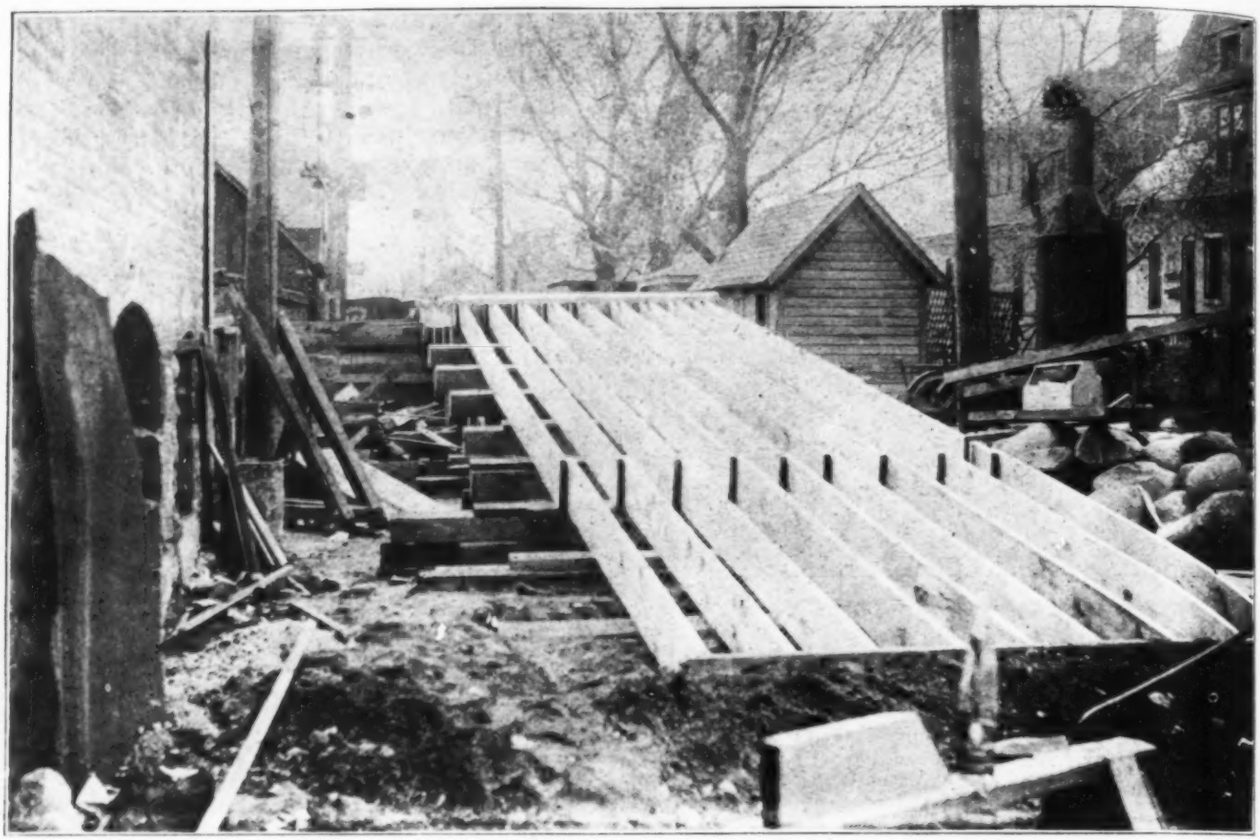
Ground plan showing convenience of layout.



SNOWED UNDER.

ALMOST FINISHED.

THAWING OUT.



THIS INCLINE, BUILT OF ORDINARY LUMBER, PROVED A SIMPLE SOLUTION OF THE PROBLEM OF PROVIDING STORAGE SPACE ABOVE THE MIXER.

by trucks through an alley in the rear of the building. The natural grade of the alley was not high enough to allow for storage bins above the mixer so a platform and approaches were constructed, the platform being about 6 feet above the ground. This left room above the mixer for a bin which would hold about 100 cubic yards of material and it was filled by the trucks which were driven up the incline to the platform, dumped into the bin, and then run down the other incline and out at the far end of the alley. This bin was sufficiently large so that a short interruption to the supply of aggregates did not make it necessary to stop the mixer and wait for more. The tower with elevator was immediately in front of the mixer.

The large photograph on this page shows the incline in the alley under construction. The other photograph shows the first of the three units nearing completion and the two views taken during the winter of 1920 when extreme cold weather made it almost impossible to carry on the work. In spite of these difficulties, however, the new unit, which cost about $400,000, is now ready for use.

ILLINOIS ISSUES HIGHWAY BULLETIN

THE Division of Highways of the State of Illinois, S. E. Bradt, Superintendent of Highways, and Clifford Older, Chief Highway Engineer, has started a mimeographed highway bulletin, issued from time to time. As Illinois is one of the largest states and is looked upon as a leader by many of the other states, this bulletin undoubtedly will be read with interest by contractors and engineers in other parts of the country. Parts of an article entitled, "What is the Future for Highway Work in Illinois?" follows:

"The conditions which now confront road building and structural work of all kinds, as well as every class of business, are familiar to everybody. When these conditions will be relieved is uncertain. Both cars and locomotives must be built in order to meet the traffic requirements. This cannot be done in a few months, but will undoubtedly require a number of years. This all means that while we cannot proceed with the improvement of this system of reads as rapidly as we had anticipated, we must put forth every effort to carry on the work as fast as the situation will permit. It also indicates the desirability of giving relief to the public through the taking over of the entire state bond issue system, including its earth roads, its gravel and macadam roads for state maintenance. Had we been able to improve the system as rapidly as we had hoped this would not have been necessary, but in order that the public may receive the greatest benefit as soon as possible it appears that this policy should now be adopted. This would involve the thorough grading, dragging, and, if possible, the oiling of the earth roads. It would mean the resurfacing of the gravel and macadam roads where necessary.

"This work should be carried on through a patrol system, each patrolman being furnished with equipment in the form of trucks, graders and drags, and put in charge of a patrol district of from twenty to thirty miles, depending upon the character of his work. While much of the work would not be of permanent and lasting value it would bring the roads into better alignment for the hard surfacing which would come as rapidly as the situation would permit."

MORTAR LINING STOPS WEAR ON CHUTES

By J. H. Williams

ABOUT a year ago Joseph Davis, Superintendent of Construction for the Illuminating Company of Cleveland, Ohio, installed some automatic stokers. From previous experience Mr. Davis found the taper chutes connecting the storage hopper and the feeder for the grates had a tendency to wear in a short time, and as an experiment Mr. Davis lined these chutes with mortar which was made of 1 part cement and 2 parts sand. The mortar was 1¼ in. thick and reinforced with common chicken wire. Owing to the fact that these chutes are on a very steep angle, it was necessary to place this material very dry in order to hold. Recently Mr. Davis had occasion to remove one of these chutes and examination showed that the mortar had not cracked nor did it show any signs of wear, although it had been in use and coal had been fed over its surface for at least a year.

The Illuminating Company is planning to adopt this method on all of their automatic stokers.

GOOD ROADS SPEED CONSTRUCTION

THE service that can be effected by good roads never was better illustrated than by the quick work done in constructing the Kerckhoff Dam on the San Joaquin River about 40 miles from Fresno, California.

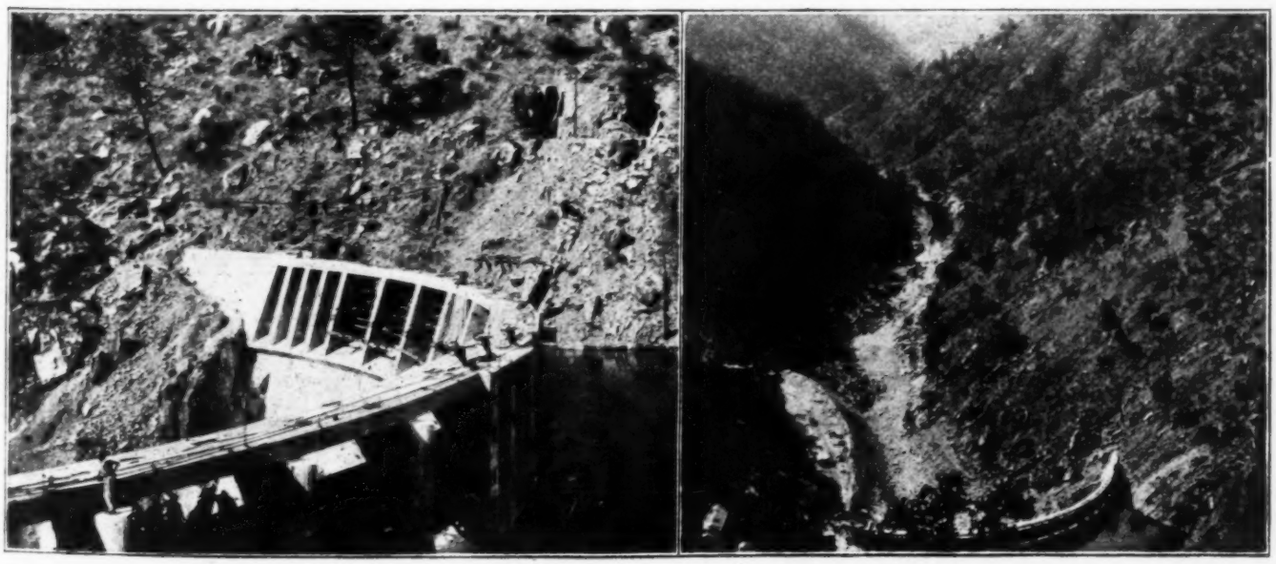
As may be seen from the picture at the bottom of this page, the dam is situated at the bottom of a narrow canyon and in order to get materials and men to the site of the dam, to the power house several miles further down stream, and to the various portals of the tunnels, about 16 miles of road had to be constructed. The soil was soft and rather sandy and soon it became evident that the roads would need considerable care if they were to stand up under the heavy traffic.

Soon after work was begun the problem of maintaining the roads in first-class condition was taken up and it was decided to water them every night. In addition to the watering considerable grading was done wherever needed and after these methods had been in operation a short while the roads began to grow firmer. They stood up under the heavy loads in excellent fashion and because of the service they rendered the San Joaquin Light and Power Company was able to construct the dam in record time.

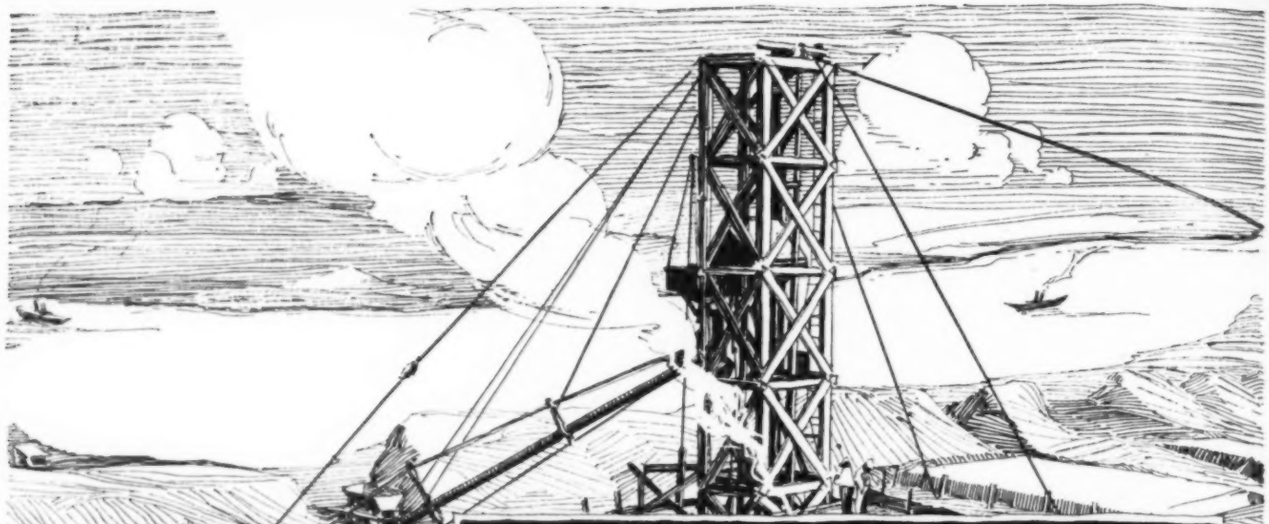
The Kerckhoff Dam contains 23,489 cu. yd. of concrete and drilling was started May 20, 1919. The first concrete was poured on August 12, and the dam was completed December 15 of the same year.

The dam is a constant angle-arched dam and is 115 ft. high, including the foundation. Its length on top is 570 ft., its thickness near the crest 10 ft. and at the base 36 ft. It impounds 8,000 acre ft. of water at 985 ft. elevation. The water is conveyed to the power house through a tunnel 16,875 ft. long with an average driven cross section of 320 sq. ft. (18 by 18 ft.). The tunnel was begun June 6, 1919, and finished July 27, 1920.

So great is the demand for hydro-electric power in California that the first of the three power units was busy supplying power within a few minutes after W. G. Kerckhoff, president of the company, turned on the water on August 15, 1920. The other two units were not finished at that time, but work was being rushed to get them ready at the earliest possible moment. Rex C. Starr is construction engineer in charge of the development. Henry R. Stevens is superintendent of construction and L. L. Ellis is assistant superintendent.



A "CLOSEUP" OF THE KERCKHOFF DAM AT THE LEFT. THE MEN IN THE FOREGROUND ARE INSTALLING THE BIG TAINTOR GATES. AT THE RIGHT THE DAM MAY BE SEEN IN THE BOTTOM OF THE VALLEY. THIS PHOTOGRAPH WAS TAKEN FROM THE INCLINED RAILROAD OVER WHICH ALL THE MATERIALS WERE CARRIED.



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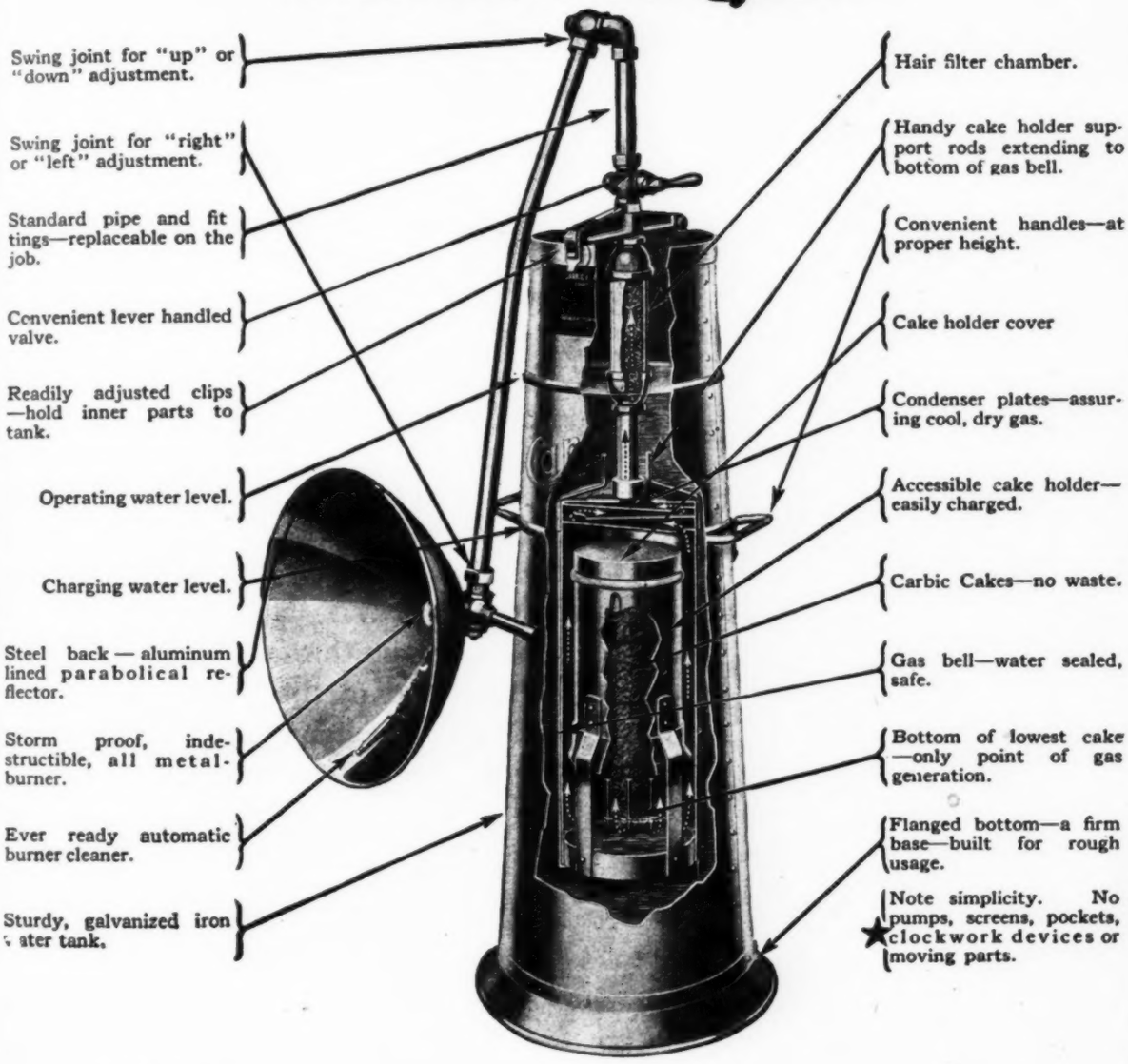

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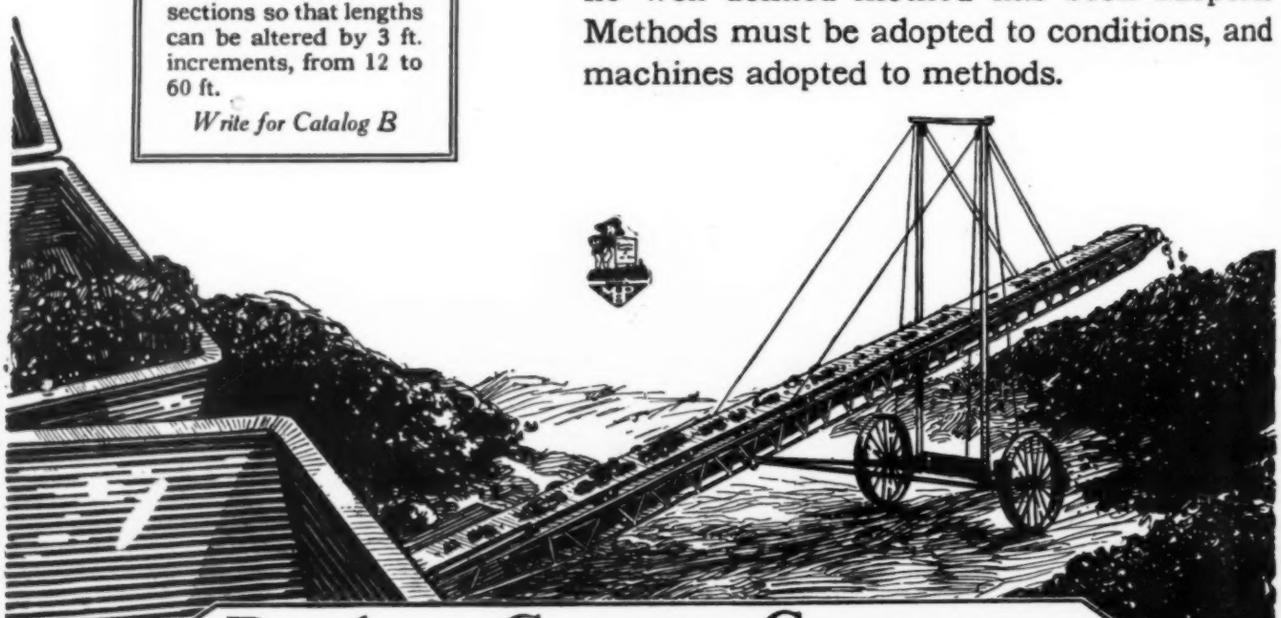

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7—The famous Parco Traction lays its track, runs on it and then pulls it up. There is no strain on the links.

In short, all the elements of construction and design have been welded into a powerful tool of extraordinary digging capacity.

We have machines in stock ready for immediate shipment. Why let that job of yours hang over till next season? Parsons will help you finish it before winter comes.

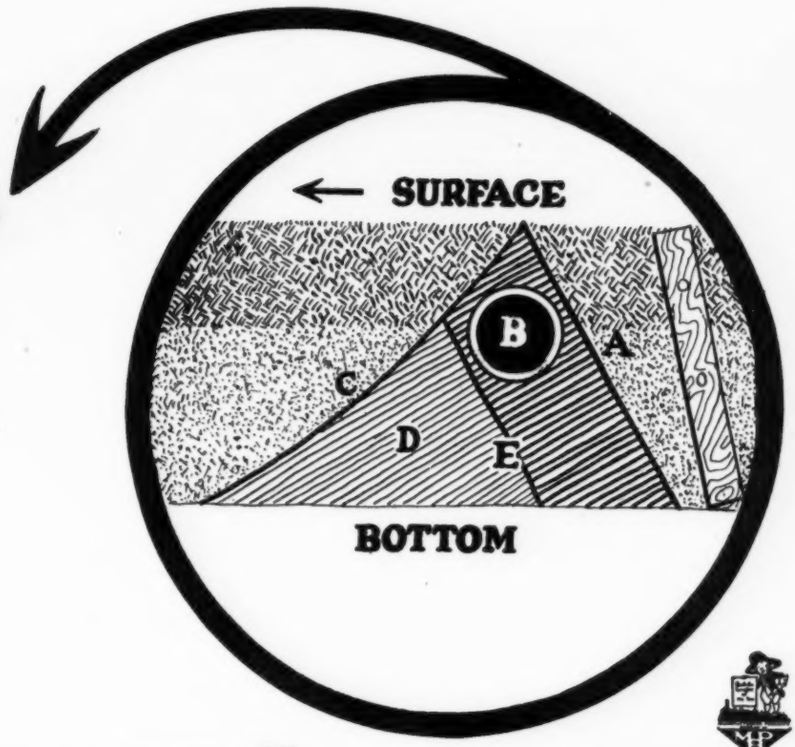
PARSONS

g To The Limit

Graphic diagram illustrates how completely Parsons reduces the element of hand digging.

A. Parsons boom with buckets digging at an angle of 30 degrees and working close to a sewer pipe.
B. Cross section of sewer pipe.
C. Lines cut by Parsons on other side of pipe on excavator's forward travel.
D. Area of earth excavated by the "Instantaneous" reverse action".
E. to A. Earth area untouched by Parsons but so thin it can be kicked away.
C. to A. Earth area that would remain untouched by an excavator without the "Instantaneous Reverse" feature.

Truly Parsons affords the maximum of machine digging.



r you've picked a Parsons, you stop picking.

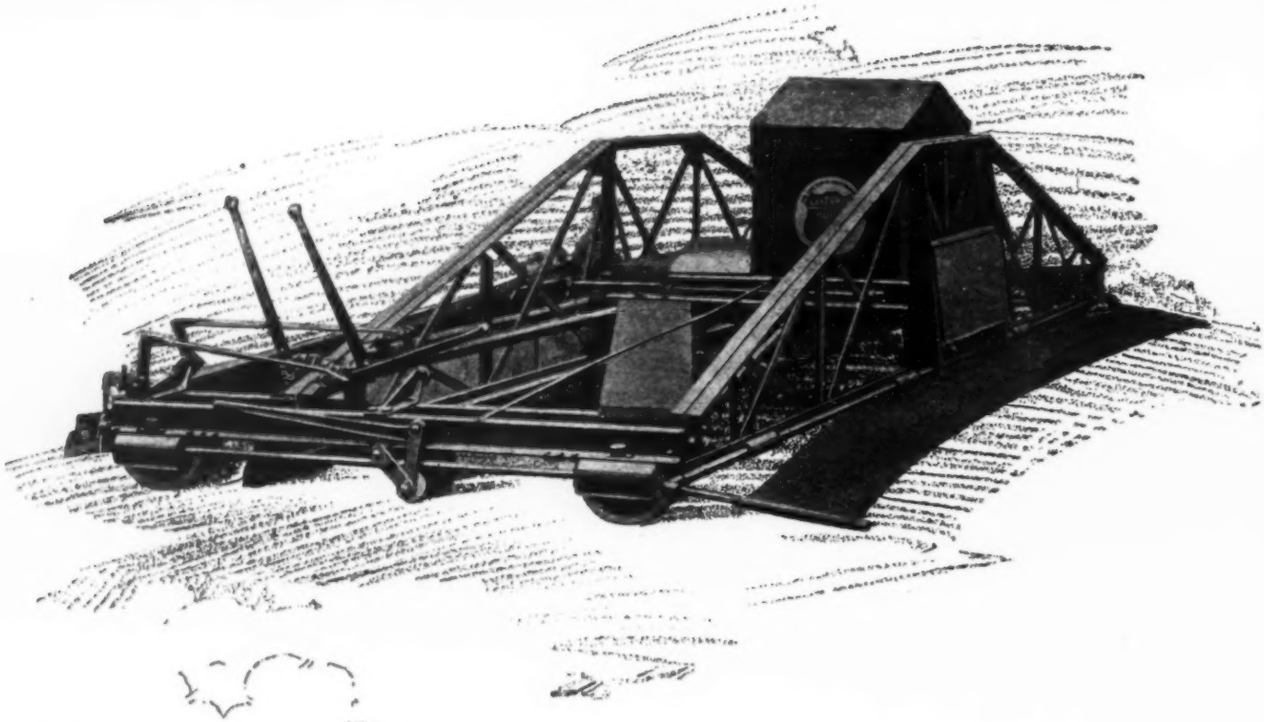
The Parsons Company

NEWTON, IOWA, U.S.A.

NEW YORK, 145 CENTRE ST. EASTERN DISTRICT BRANCH
CHICAGO, 11 SO. LA SALLE ST CENTRAL DISTRICT BRANCH

LOUISVILLE
MILWAUKEE
DENVER
HOUSTON
SALT LAKE CITY
SAN FRANCISCO
LOS ANGELES
PORTLAND
WINNIPEG
TORONTO
OTTAWA
MONTREAL

EXPORT DEPARTMENT
ALLIED MACHINERY COMPANY OF AMERICA



LAKEWOOD Road Finisher

	Price F.O.B. Cleveland
Price—10, 12, 14, 15, 16, 18 and 20 ft. widths	$ 1800.00
Price for 22 or 24 ft. widths	2000.00

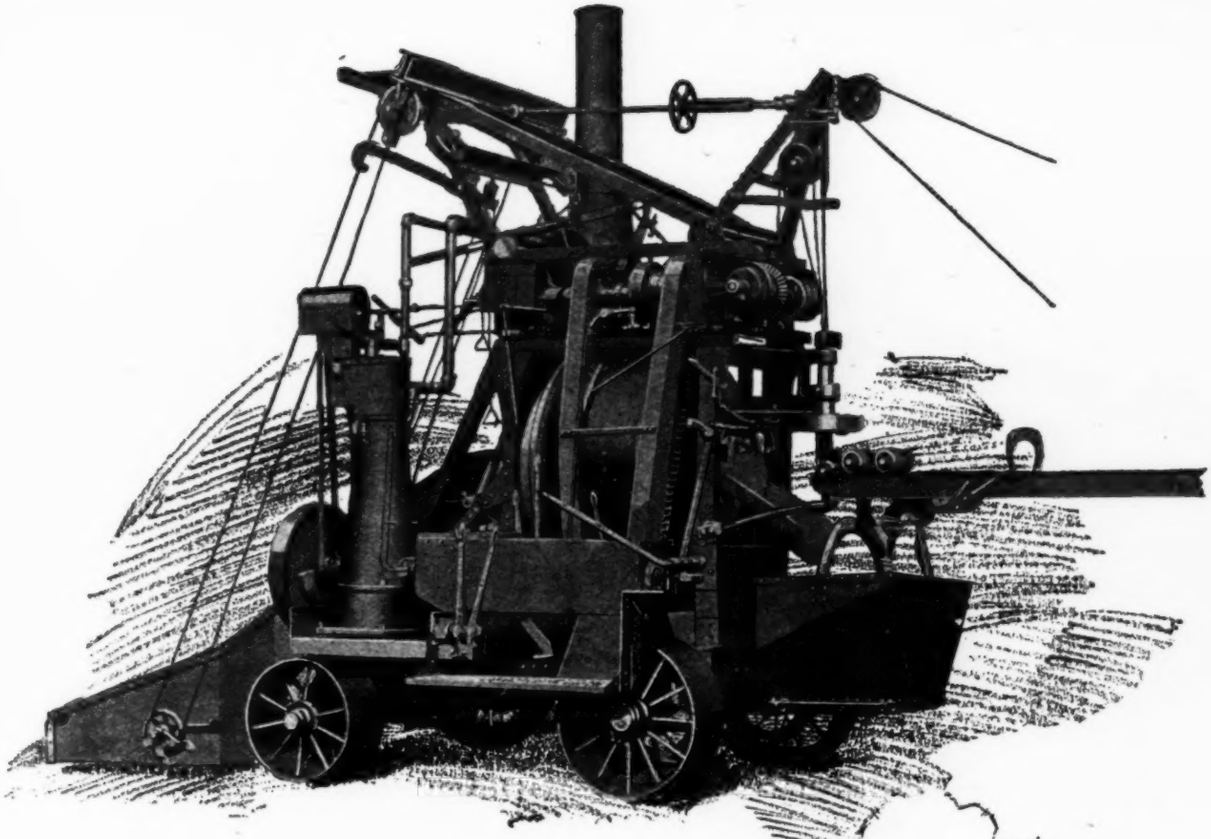
Immediate Delivery

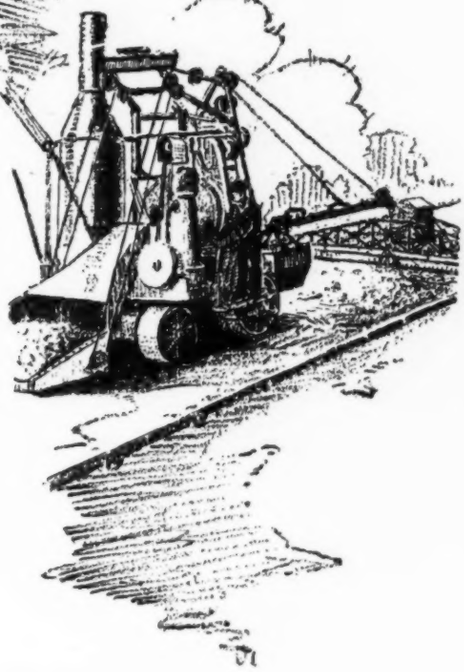
NEW YORK CITY PHILADELPHIA BOSTON DALLAS RICHMOND HOUSTON ATLANTA CHICAGO MILWAUKEE CLEVELAND

LAKEWOOD BUILT TO LAST

Lakewood

THE LAKEWOOD ENGINEERING





The LAKEWOOD-MILWAUKEE Paver

	Price F.O.B. Milwaukee
Steam or Gasoline Power	$ 6775.00
Continuous Platform Traction	900.00 Extra

Immediate Delivery

WRITE THE NEAREST OFFICE

MEMPHIS BUFFALO DETROIT SEATTLE ST. LOUIS PORTLAND INDIANAPOLIS MINNEAPOLIS KANSAS CITY DES MOINES PITTSBURGH SAN FRANCISCO LOS ANGELES

EXPORT-ALLIED MACHINERY CO. OF AMERICA, N.Y. CITY

Methods and Machines

ALMACOA

COMPANY, CLEVELAND, U. S. A.

LAKEWOOD Batch Box Car
with two all Metal Tip-Over Batch Boxes

Size of Batch	Price F.O.B. Cleveland
25 cu.ft.	$ 263.00
29 cu.ft.	281.00
37 cu.ft	299.00

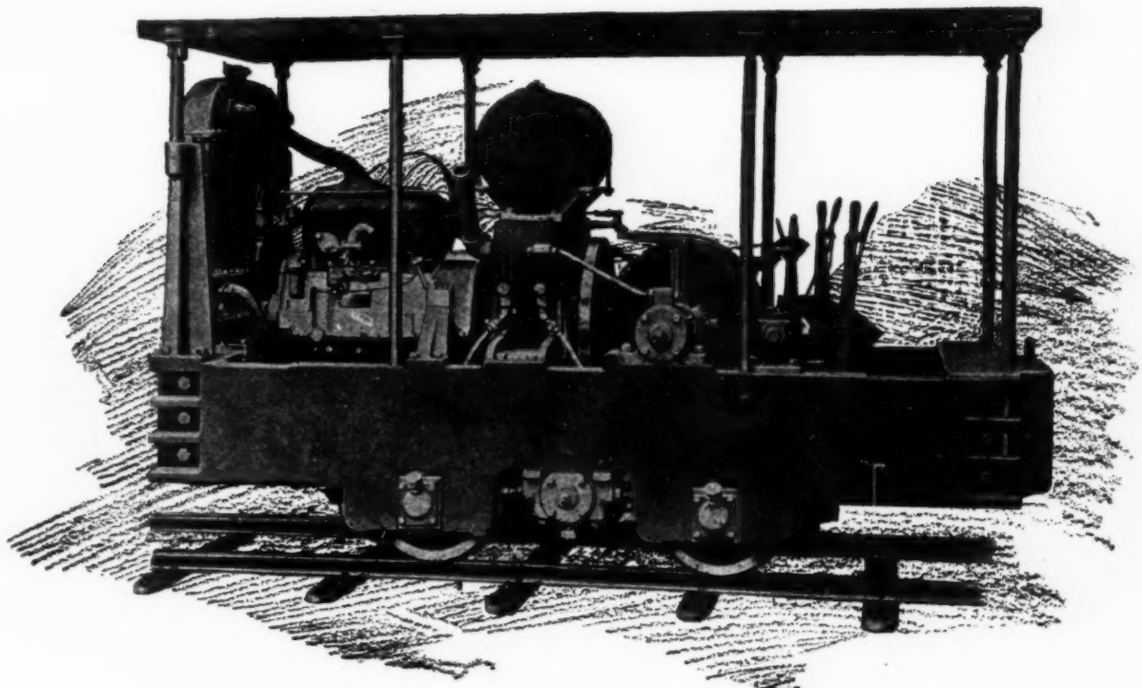
Immediate Delivery

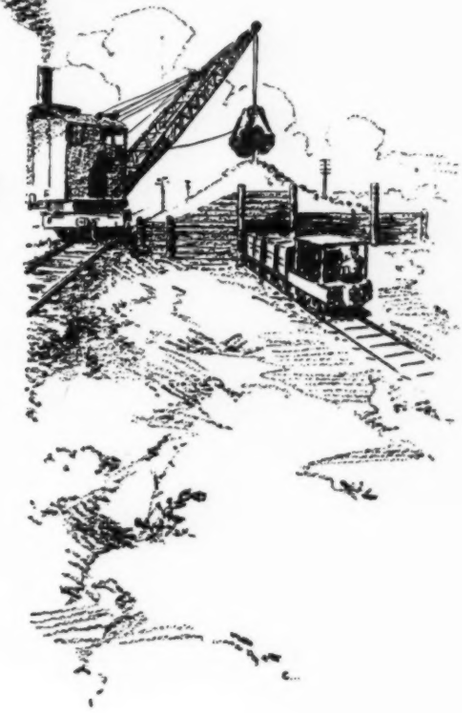
NEW YORK CITY PHILADELPHIA BOSTON DALLAS RICHMOND HOUSTON ATLANTA CHICAGO MILWAUKEE CLEVELAND

LAKEWOOD BUILT TO LAST

Lakewood

THE LAKEWOOD ENGINEERING





LAKEWOOD-BURTON Locomotive

	Price F.O.B. Cincinnati
3½ Ton	$ 2700.00
6 Ton	4500.00

Immediate Delivery

WRITE THE NEAREST OFFICE

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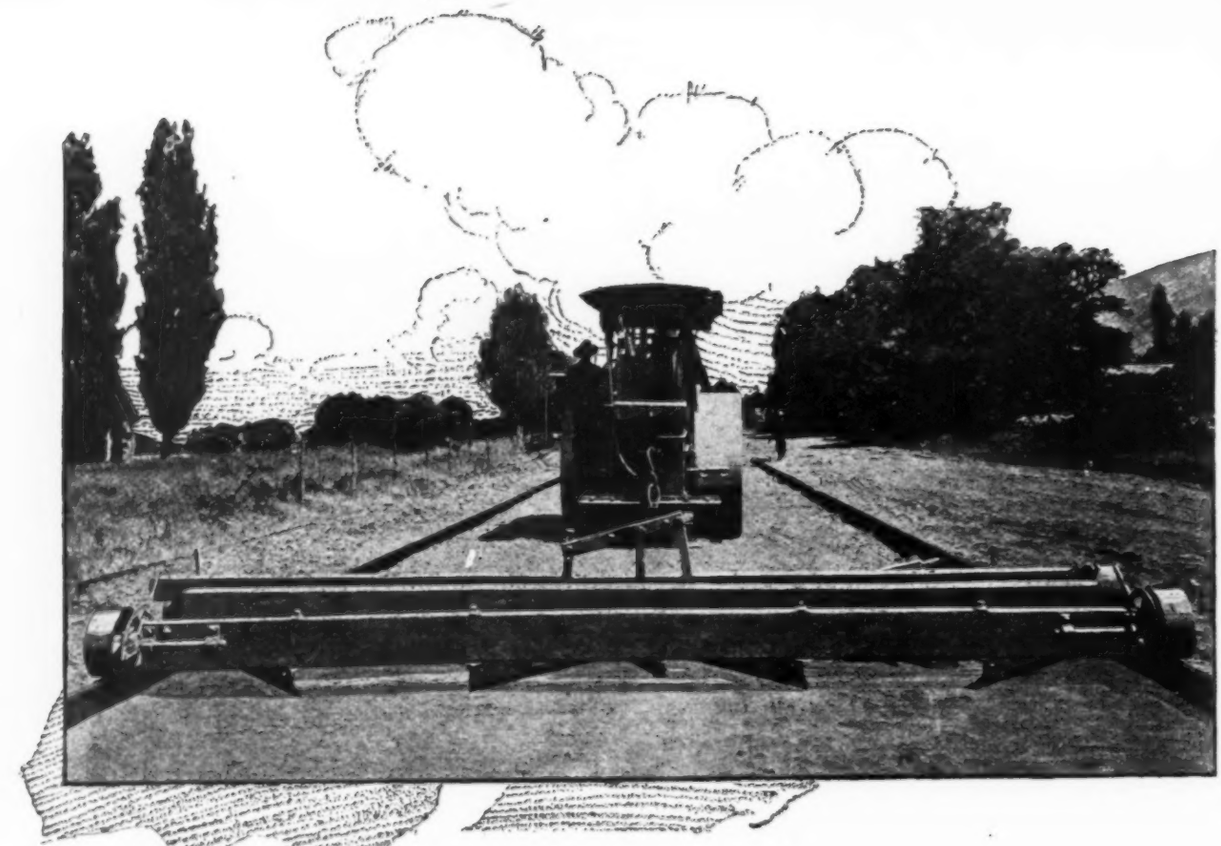
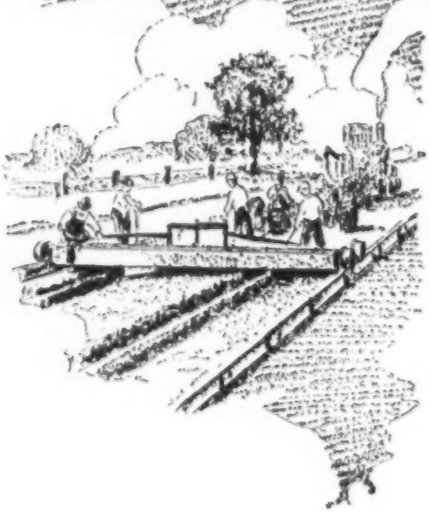
EXPORT-ALLIED MACHINERY CO. OF AMERICA, N.Y. CITY

Methods and Machines

ALMACOA

COMPANY, CLEVELAND, U. S. A.





LAKEWOOD Subgrader

Price F.O.B. Cleveland

Price for 10,12,14, 15,16,18,20 and 22 ft. widths $ 700.00

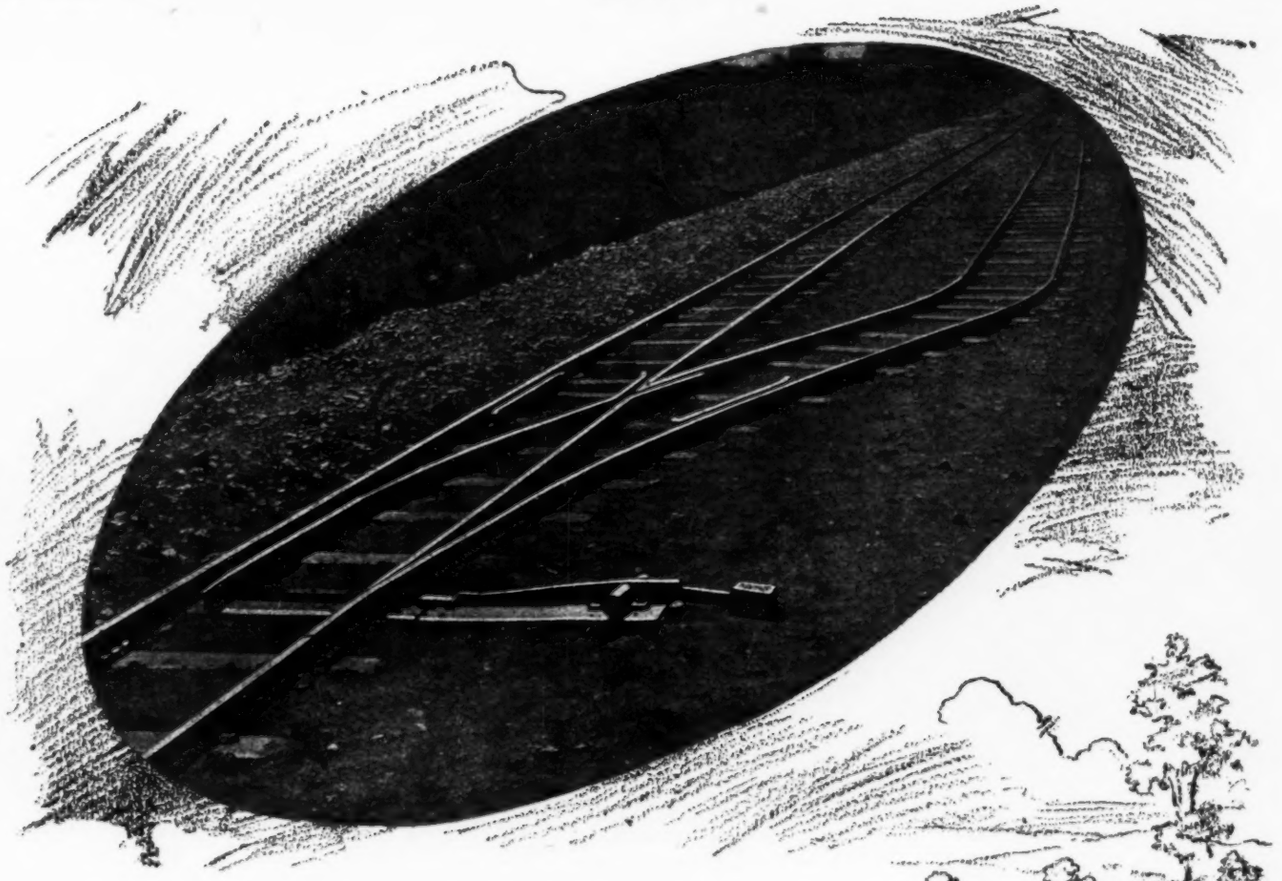
Immediate Delivery

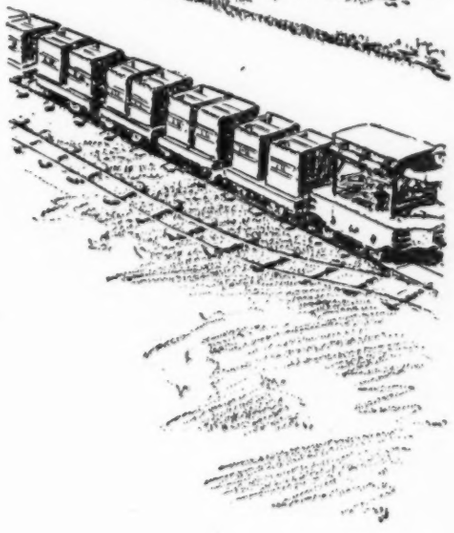
NEW YORK CITY PHILADELPHIA BOSTON DALLAS RICHMOND HOUSTON ATLANTA CHICAGO MILWAUKEE CLEVELAND

LAKEWOOD BUILT TO LAST

Lakewood

THE LAKEWOOD ENGINEERING





LAKEWOOD

Standard Road Track with Pressed Steel Ties (riveted)—15 foot lengths

Price F.O.B. Cleveland

Price per mile Joint Ties included	$ 6846.40
Lakewood Standard Switches	125.00

Immediate Delivery

WRITE THE NEAREST OFFICE

MEMPHIS DETROIT ST. LOUIS INDIANAPOLIS DES MOINES SAN FRANCISCO
BUFFALO SEATTLE PORTLAND MINNEAPOLIS PITTSBURGH LOS ANGELES
KANSAS CITY

EXPORT-ALLIED MACHINERY CO. OF AMERICA, N.Y. CITY

Methods and Machines

ALMACOA

COMPANY, CLEVELAND, U. S. A.

THE money making shoveler employers know that just as soon as a shovel has lost 7/8 of an inch of its edge that from that time on it is a destructive force to both efficiency and economy. Further, these money making employers act on that knowledge by absolutely destroying all shovels when they reach that **7/8 inch short** stage. They do not compromise the situation by transferring such shovels to lighter jobs or letting them accumulate around the job or in the yard—they destroy them immediately so that the shovelers only see good condition shovels.

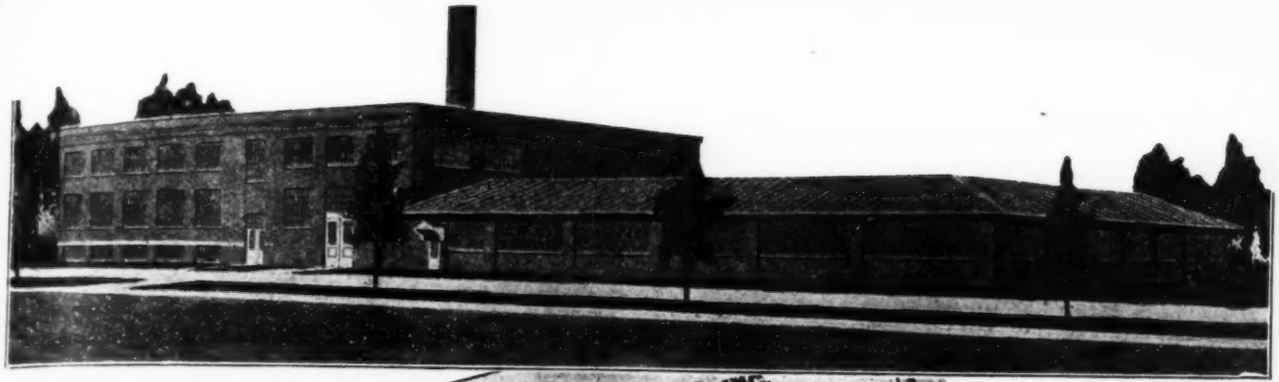
RED EDGE SHOVELS make a harder fight for that 7/8 inch than any other shovel can possibly make, and they make the fight not only to retain that 7/8 inch as long as possible, but to keep a straight and true and sturdy shoveling edge all the while. As the back end of the blade is just as tough as the edge, Red Edge blades don't get out of shape, and the tough handle and the tough straps always keep the lift and hang exact. Of course, you know why—Chrome Nickel Steel Heat Treated Blades and XX Second Growth Northern White Ash Handles.

SIMPLY INSIST ON RED EDGE SHOVELS.

THE WYOMING SHOVEL WORKS
WYOMING, PENNA., U. S. A.

WYOMING RED EDGE SHOVELS

EXPORT DEPARTMENT
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA



The New C. H. & E. Factory

C.H.&E. MANUFACTURING CO. INC.

Manufacturers of CONTRACTORS' EQUIPMENT. GASOLINE ENGINES.

CHE MFG CO

Long Distance Telephone Harrison 908

Cable Address "C.H.&E." Western Union Code

MILWAUKEE, Wis.

August 14th, 1920.

Manufacturers Publicity Bureau, Inc.
Chicago, Ill.

Att. Mr. Lindsey

Gentlemen:

We want to inform you that we have broken ground and are building at the present time a new addition to our present factory. This new modern saw tooth construction addition with concrete floors and brick walls will be used entirely for an erection floor, where the different models of outfits we manufacture will be run through in lots of fifty on the plan of automobile assembling.

With this new addition a full city block of 300 feet long by 150 feet wide will be occupied and give us a total manufacturing space of 51,000 square feet.

We are showing herewith a view of this new addition and we want you to publish this for general information to the trade.

Yours very truly,

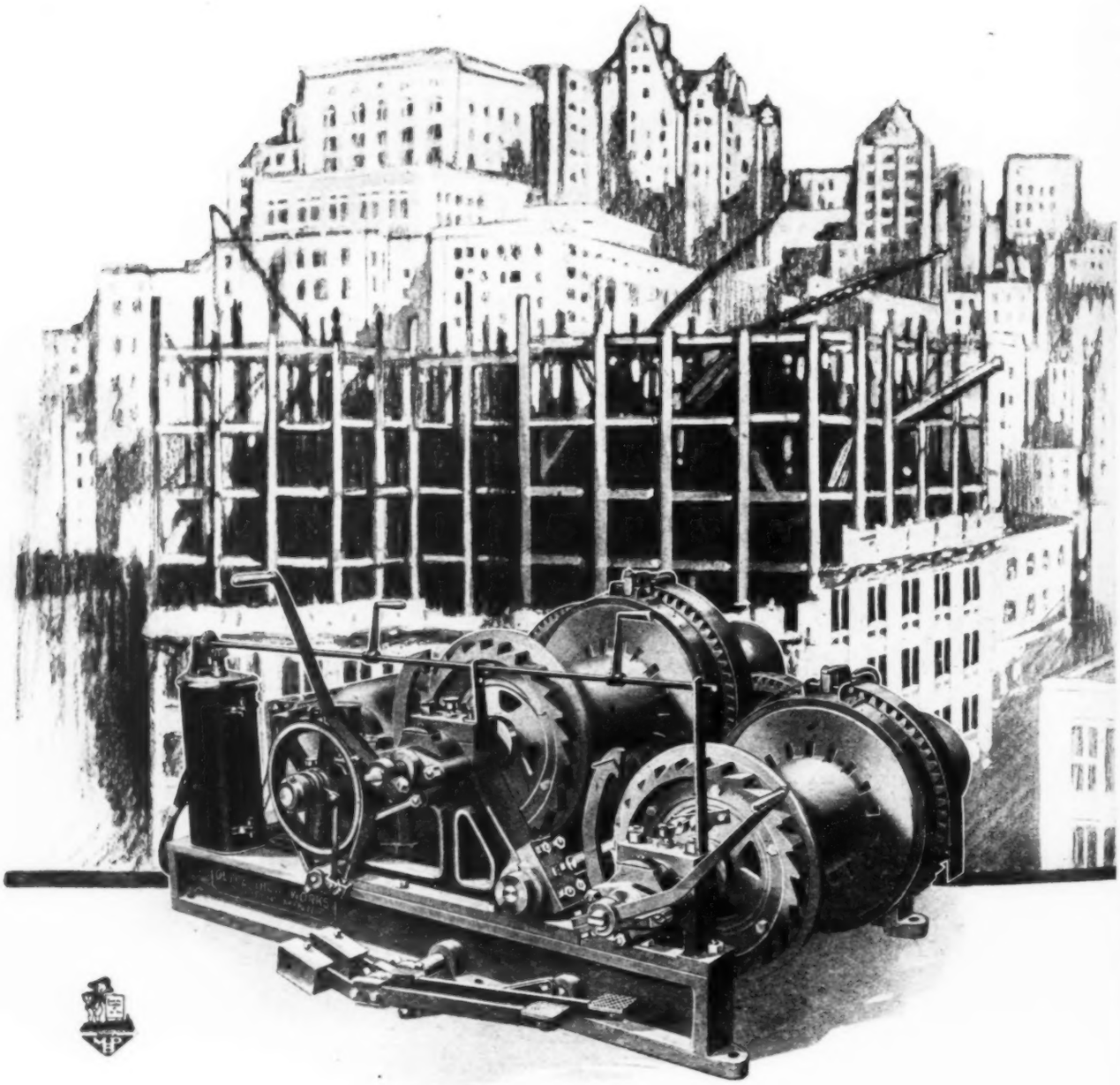
C H & E Manufacturing Co., Inc.

Frank P. Hase,
Pres.

FPH*ID.

A Group of Visitors at the C. H. & E. Factory, July 23, 1920

What The Clyde Automatic



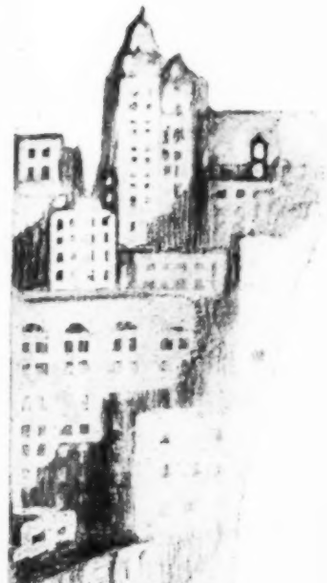
WHEREVER hoisting equipment is used, engineers and contractors are universally selecting Clyde. Whether the job calls for electric, steam or gasoline hoists, Clyde is the first choice. Because, for years the name Clyde has been a *national symbol* by which hoisting machinery is bought, and the Clyde name assures the absolute utmost in hoisting performance.

CLYDE

The CLYDE

Representatives In Principal Cities~

Mechanical Brake Means To You



AMONG the many features exclusive to the Clyde Electric Hoists of interest to you is the *Automatic Mechanical Brake* — meaning *Safety First.*

It is quick acting, positive, strong and simple, and unfailingly prevents backward rotation of the gearing in case the electric power is interrupted. This patented brake, in addition to foot brakes, is furnished on every non-reversing hoist not equipped with a solenoid brake.

Note the 6 points in its design shown below.

Clyde Iron Works Sales Company

Duluth, Minn., U. S. A.

Sole Distributors for Clyde Iron Works

Branch Offices and Warehouses:

NEW YORK
141-149 Centre Street

CHICAGO
11 So. LaSalle Street

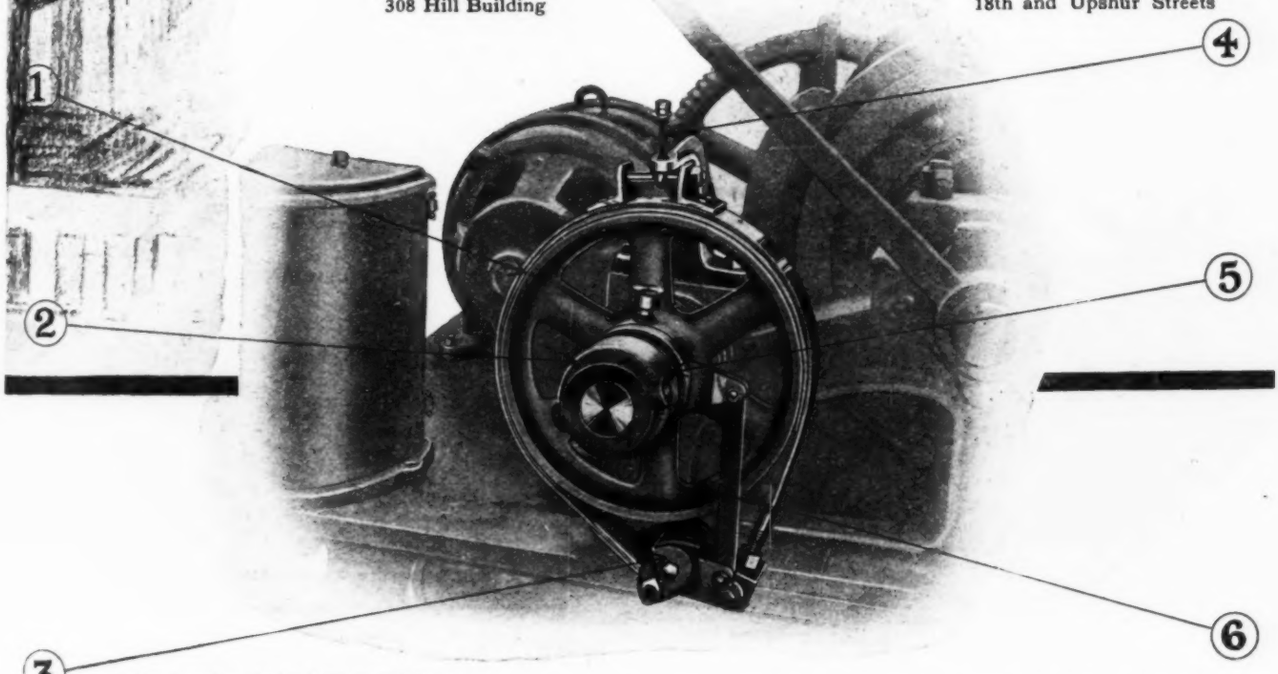
JACKSONVILLE
308 Hill Building

EXPORT DEPARTMENT
ALLIED MACHINERY COMPANY OF AMERICA

NEW ORLEANS
309 Magazine Street

SEATTLE
542 First Avenue, South

PORTLAND
18th and Upshur Streets



1. Brake band entirely disengaged from brake disc when hoist runs in proper direction. Automatically engages when motion is reversed.

2. Housing for coil spring which maintains proper pressure on friction collars.

3. Differential rocker, actuated by friction collars. Loosens brake band when running in proper direction, tightens it when motion is reversed.

4. Supporting spring for brake band.

5. Lubricated friction collars with arm for actuating differential brake rocker.

6. Connecting arm between friction collars and differential rocker.

LINE

STEAM HOISTS
ELECTRIC HOISTS
GASOLINE HOISTS
BELT HOISTS
DERRICK FITTINGS
STEEL DERRICKS
EXCAVATORS
TRACTION CRANES
BLOCKS and SHEAVES
LOGGING MACHINERY

CLYDE

A Clyde Man Will Call Anytime.

Plenty of Power for

AUSTIN Rollers are famous for their power. Not only have they ample power for the hardest kind of rolling jobs—on steep grades or in soft material—but there is plenty of *reserve* power.

This reserve power makes it possible to use Austin Rollers for pulling scarifiers, or graders, for operating crushers, or for any of the jobs arising in road work where power margin is needed.

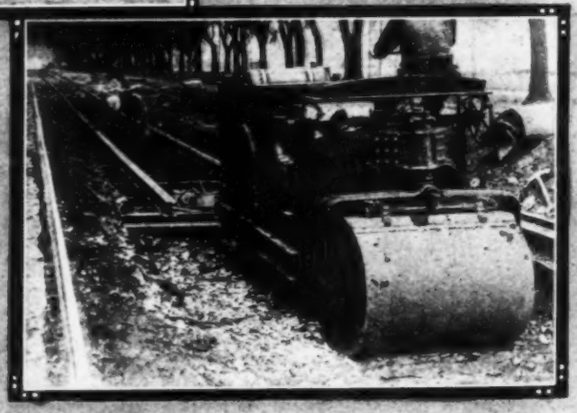
In such roller work it's the *Power* that counts—that makes for *real profit making* performance.

This explains why contractors and municipalities are so universally adopting Austins as the *standard* Roller.

Motor Roller operating Austin Gyratory Crusher

Pneumatic Scarifier attached to Roller

Motor Roller on sub-grade in Florida



Tandem Roller rolling sub-grade for street car track

Makers of:
MOTOR ROLLERS
STEAM ROLLERS
SCARIFIERS
ROCK CRUSHERS
STONE SCREENS
STONE ELEVATORS
PORTABLE BINS
QUARRY CARS
STONE SPREADERS

THE AUSTIN-WESTERN
CHICAGO

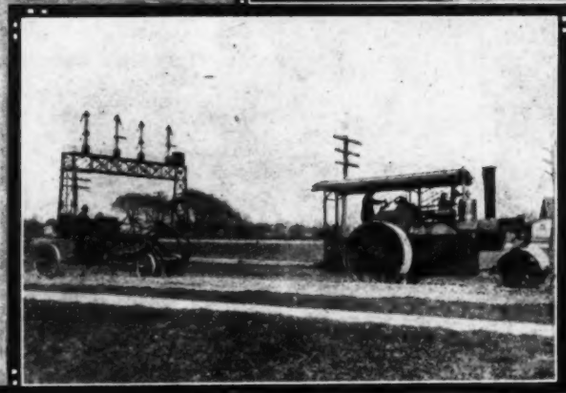
NEW YORK BOSTON PHILADELPHIA MEMPHIS
ALBANY ST. PAUL OKLAHOMA CITY RICHMOND
DALLAS SALT LAKE CITY

the Hardest Jobs

FOR every kind of rolling job there is an Austin Roller—Motor Rollers, Steam Rollers and Tandem Rollers. Each type has many features especially fitting it to its special class of work. By using Austins you can get just the machine you need for your job—no necessity of fitting the job to the machine. Austin made the first American Motor Roller and their leadership has never been questioned. Motor Rollers made in 5 sizes—7 to 15 tons.

During the war the United States and Allied Goverments purchased over 700 Austin Motor Rollers, more than ten times their combined purchases of all other rollers and at higher prices.

Write for the Austin Roller Catalogs.



Steam Roller pulling Austin Steerable Scarifier

Motor Roller pulling Austin Steerable Scarifier

Steam Roller pulling Austin Grader

Motor Roller pulling crusher up Zion's Hill, Jerusalem

ROAD MACHINERY CO.

ILLINOIS

NASHVILLE LOUISVILLE LOS ANGELES JACKSON
ATLANTA PITTSBURGH NEW ORLEANS PORTLAND
COLUMBUS SAN FRANCISCO

EXPORT DEPARTMENT ALLIED MACHINERY COMPANY OF AMERICA

Makers of

ROAD OILERS
ROAD GRADERS
ELEVATING GRADERS
DUMP WAGONS
STREET SPRINKLERS
STREET SWEEPERS
MOTOR SWEEPERS
ROAD PLOWS
WHEELED SCRAPERS
DRAG SCRAPERS

THE AUSTIN-WESTERN ROAD MACHINERY CO.

For All
From Crushing The Rock

FROM crushing the raw material to maintaining the finished road, and for every step in between, Austin-Western offers a most unusual service.

Take the variety of machines. And the nation-wide organization, so well equipped to give real service. Every road problem can be answered here.

The "Two-Blow-Stroke" Crusher

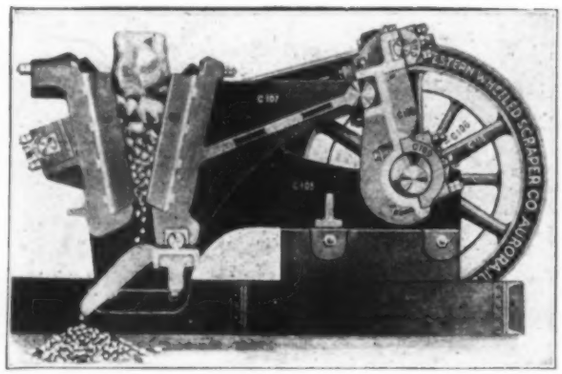
The Aurora Crusher is one example. Here is a jaw crusher which *doubles the blow on the rock* for every revolution of the crankshaft.

This means, for one thing, that the Aurora turns out more tonnage per horsepower than any other crusher.

It means, as well, balancing and equalizing the strain and thus greatly reducing the vibration on the machine.

This is the only jaw crusher which does effective work 100% of each revolution.

Ask for circular fully describing the Aurora Crusher —also the complete line of Aurora Rock Crushing and Handling Equipment which includes



Aurora Two-Blow-Stroke Crusher

The most efficient and simple jaw crusher built. Toggle Plates and springs done away with entirely. Two powerful blows to every revolution of the crankshaft—double the number any other crusher gives.

- Revolving Screens
- Standard Elevators
- Folding Portable Elevators
- Stationary and Portable Bins
- Gravel Screening Plants
- Gravel Feeding Attachment to Crusher
- Dumping Hoppers to Feed Elevators
- Portable Track and Quarry Cars etc., etc.

Makers of:
MOTOR ROLLERS
STEAM ROLLERS
SCARIFIERS
ROCK CRUSHERS
STONE SCREENS
STONE ELEVATORS
PORTABLE BINS
QUARRY CARS
STONE SPREADERS

THE AUSTIN-WESTERN
CHICAGO

NEW YORK BOSTON PHILADELPHIA MEMPHIS
ALBANY ST. PAUL OKLAHOMA CITY RICHMOND
DALLAS SALT LAKE CITY

ALLIED MACHINERY COMPANY OF AMERICA

THE AUSTIN-WESTERN ROAD MACHINERY CO.

Road Work
To Sweeping The Road

NOT only rock crushers; not only road building machines; not only road repairing machinery, but machines for road maintenance as well are included in the Austin-Western line.

Here is one.

The Austin Motor Sweeper

This is a self-contained unit—only one operator required.

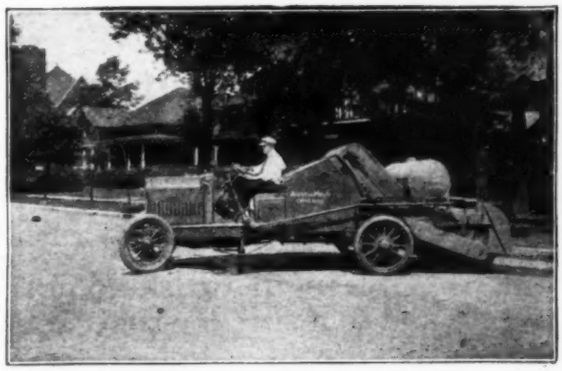
It is self-propelled.

It sprinkles. It sweeps.

It collects all kinds of street dirt. And all in one operation.

It transports and dumps.

It is rapid and, most of all, sanitary—no dust—no noise, and therefore is ideal for night work in residence districts and for all sweeping. It is truly the *modern* street sweeper.



Austin Motor Sweeper

There is a special book which tells all about this latest addition to the Austin Municipal Line.

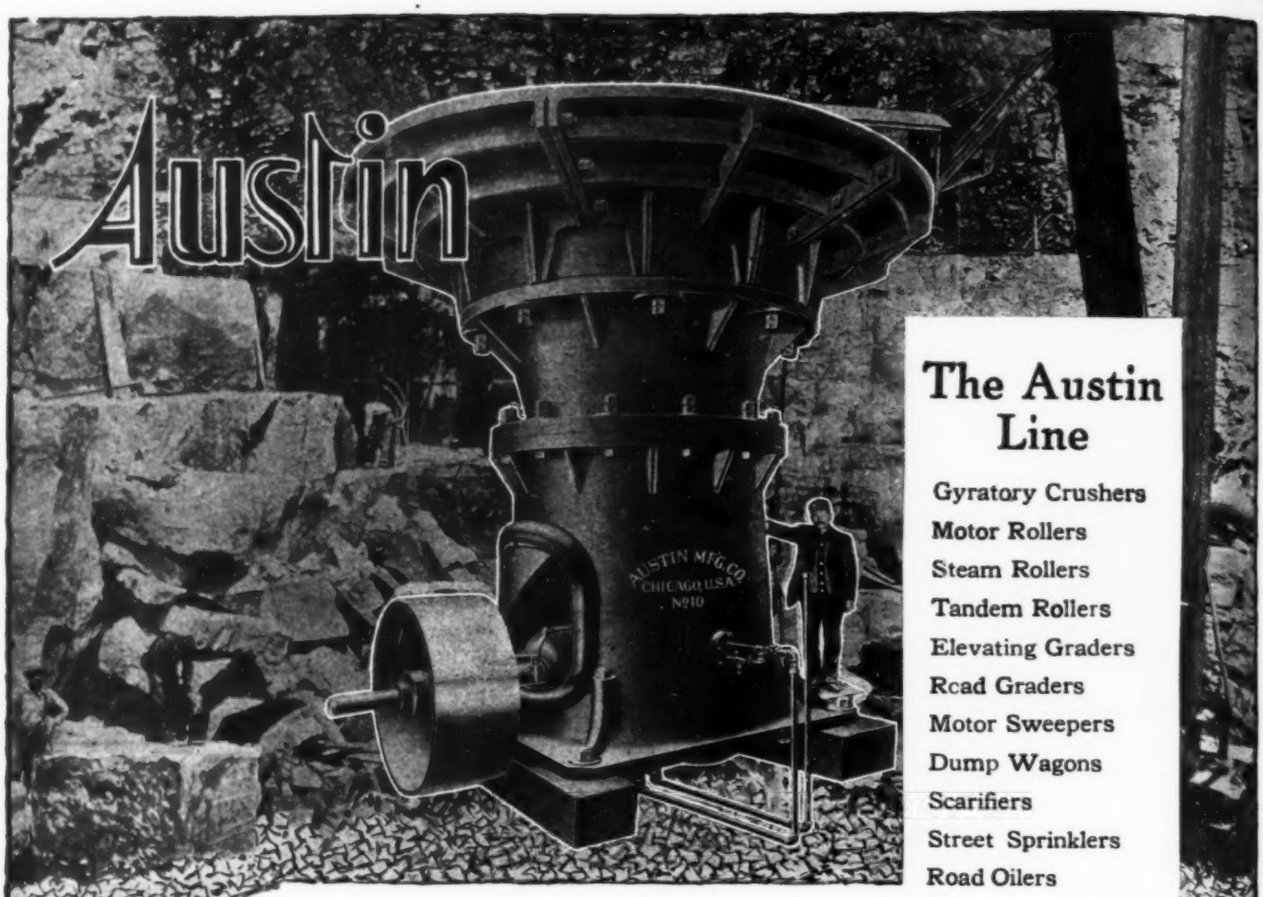
Write for your copy at once, so you won't forget. A postal will bring it.

ROAD MACHINERY CO.
ILLINOIS

NASHVILLE LOUISVILLE LOS ANGELES JACKSON
ATLANTA PITTSBURGH NEW ORLEANS PORTLAND
COLUMBUS SAN FRANCISCO

ALLIED MACHINERY COMPANY OF AMERICA

Makers of:
ROAD OILERS
ROAD GRADERS
ELEVATING GRADERS
DUMP WAGONS
STREET SPRINKLERS
STREET SWEEPERS
MOTOR SWEEPERS
ROAD PLOWS
WHEELED SCRAPERS
DRAG SCRAPERS



The Austin Line

Gyratory Crushers
Motor Rollers
Steam Rollers
Tandem Rollers
Elevating Graders
Road Graders
Motor Sweepers
Dump Wagons
Scarifiers
Street Sprinklers
Road Oilers

Two Factors in Crusher Operation

In crushers there are two fundamental requirements necessary for satisfactory operation—STRENGTH and CAPACITY.

Austin Gyratory Crushers have both.

Strength to "stand up" under the severe shocks and strains and to insure long life, and large capacity—the ability to turn out the greatest amount of work with the least expenditure of time and horse power.

These profit making factors are possible only by correct design and the experience gained by years of successful manufacturing.

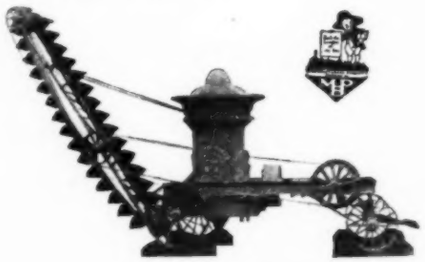
In Austin Gyratory Crushers you get every crusher advantage plus six exclusive features found ONLY in Austins.

Write for Catalog-28 telling of these six features.

Austin Manufacturing Co.

New York CHICAGO San Francisco

Canadian Agents: Mussens Limited, Montreal, Toronto, Winnipeg, Vancouver.



Austin Portable Gyratory Crusher

EXPORT DEPARTMENT
ALLIED MACHINERY COMPANY OF AMERICA

EASY TO KEEP THE BELT FROM CLOGGING

THE improved Western Elevating Grader, with dirt pan cleaner attachment has met with instantaneous popularity. It fills a long felt want. A dirt pan cleaner, added to a machine of such strength and capacity, speeds up the work.

No more stopping the machine once every round of the pit, and poking through the "cat-hole" with a stick, to keep the belt from clogging.

Work the Lever Occasionally and Keep Going

You should have our
Special Catalog SA-46

THE BEST THE WORLD PRODUCES
WESTERN
EARTH AND STONE HANDLING MACHINERY

Western Wheeled Scraper Company

Earth and Stone Moving Machinery

AURORA, ILLINOIS, U. S. A.

Founded 1877

EXPORT DEPARTMENT
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA

The Railroads are Ready

A big era of railroad construction is at hand. Get your equipment in shape. Who will receive railroad contracts?

Proven Contractors Who Have Proven Equipment

DEPENDABLENESS, rather than cost, is the deciding factor in letting railroad work. And a dependable contractor is not enough; he must have dependable car and shovel equipment.

You won't have to explain the dependable efficiency of Western car equipment. The railroads know all about it. Many of them are using Western Dump Cars themselves. The railroads know that a contractor with Western car equipment can do the work in the shortest possible time and for the least possible money.

Make your investigations NOW and be ready to ACT.

Narrow-Gauge Equipment

Western Heavy Duty 4-yard and 5-yard dump cars are the cars to keep your shovel moving in narrow-gauge work.

Send for our new Dump Car Catalog SM-51

Western Wheeled

Aurora,

EXPORT DEPARTMENT
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA

For New Construction

Steep dumping angle; wide discharge opening; sticks to an imperfect construction track; built of first-class material in a first-class way—Western factors of economy and efficiency in a dump car.

Down in New England a mixed dump car train went off the end of a high fill. The Western Dump Cars were set back on the track and the wrecks of the competing cars were carried away in them. That tells the story.

Standard-Gauge Equipment

Order the "U. S. A." Westerns. Designed for emergency work during the war. Cited for satisfactory service. Steep dumping angle; standard construction; side chains; vertical cylinders; 34 per cent greater dumping power than other makes, and all the other points of superiority that have made Western car equipment famous the world over.

A Money Maker for Contractors

Built in sizes—12, 16, 20, 25 and 30 cubic yards capacity.

Send for our new Dump Car Catalog SM-51

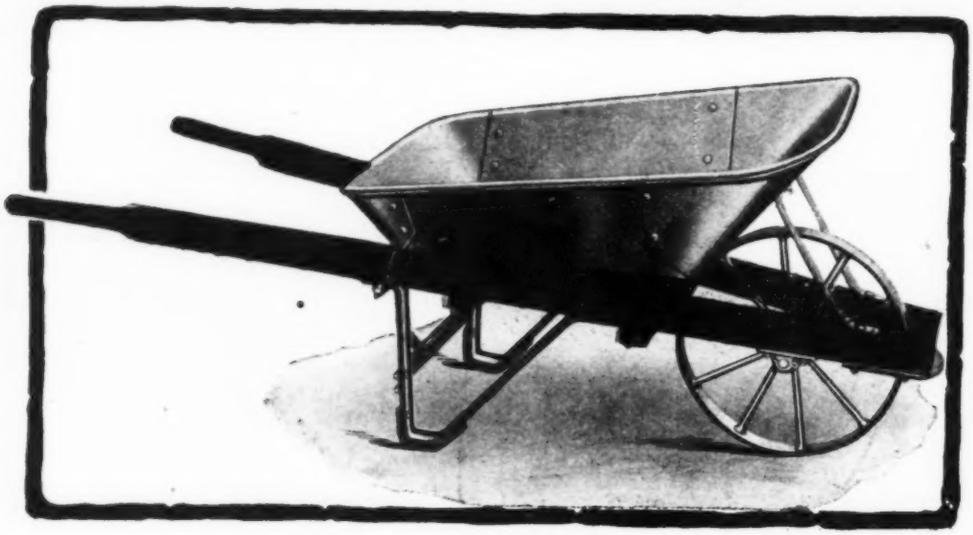
Scraper Company

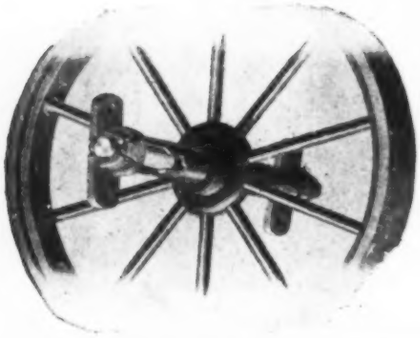
Ill., U.S.A.

EXPORT DEPARTMENT
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 Chambers St., New York, U.S.A. Cables: Almacoa New York

STERLING ON A WHEELBARROW MEANS

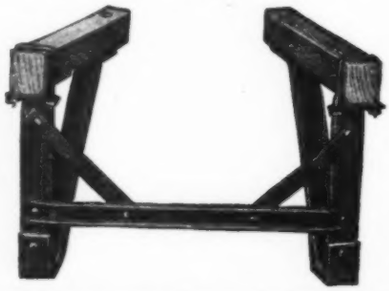
It's The Way A Sterling Is Built





The Ten-Spoke Wheel

The Self-Lubricating Bearing



The Riveted Leg Construction

The 6 Exclusive Sterling Features

1—**THESE TWO EXTRA SPOKES**—The only wheelbarrow with ten spokes—others do with eight. The extra two double tire strength, end flattened and broken tires.

2—**SELF-LUBRICATING BEARINGS NEVER WEAR**—No oiling, no squeaks, no worn-out bearings. Sterling Bearings outlast the wheelbarrow or we replace them free. This self-lubricating fea ure reduces wheeling effort 50%.

3—**THIS BROAD FLAT LEG BEARING WITH EXTRA STEEL SHOE**—Heavy Channel Iron Construction. Lasts indefinitely. Never wears through as do usual pointed legs.

4—**JUST A COTTER PIN, BUT**—It locks the axle so it can't turn with the hub. No nuts or bolts to work loose here nor to hinder the wheel. Think this little cotter pin over.

5—**HANDLES CLAMPED ON**—No bolt holes in the handles to weaken them. Here's added strength at the point of greatest strain. Sterling construction again.

6—**RIVETS vs. STOVE BOLTS**—Sterling Riveted leg construction cannot work loose. Stove bolts on ordinary wheelbarrows a constant source of trouble.

Sterling Wheelbarrow Company

NEW YORK
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CLEVELAND

MILWAUKEE, WIS.

DETROIT
CHICAGO
ST. LOUIS

CANADIAN AGENTS-MUSSENS LIMITED, MONTREAL, TORONTO, WINNIPEG, VANCOUVER

EXPORT DEPARTMENT
ALLIED MACHINERY COMPANY OF AMERICA

MORE THAN STERLING ON SILVER Sterling

That Gives You These Great Advantages

MORE WORK

When you figure the initial cost of any wheelbarrow as compared with the daily wage of the man who wheels it, you will understand why we emphasize the work a Sterling does.

For Sterlings on your job **really do mean** more work done each day. Take the **self-lubricating bearing,** for example. This one feature of Sterling construction reduces wheeling effort 50%.

Then there is the **flat** leg bearing reinforced. No tipping a Sterling — it stands where it is put while loading.

The axle is locked with a cotter pin so it can't turn with the wheel—another great advantage.

STRENGTH

Keeping wheelbarrows on the job means keeping money busy all the time. No breakdowns—no delays.

Here is the reason for the two extra spokes in the Sterling wheel. Flattened and broken tires never trouble.

And the flat leg bearing with the steel shoe for extra reinforcement. Little chance of the legs wearing through here. Another point, the legs are riveted—no stove bolts to shake loose and out.

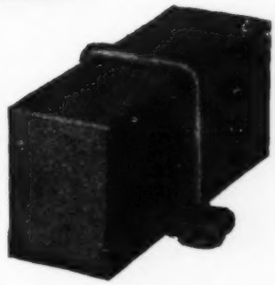
Then the handles are clamped on instead of being drilled through the center and bolted. Less splitting—no rights and lefts.

ECONOMY

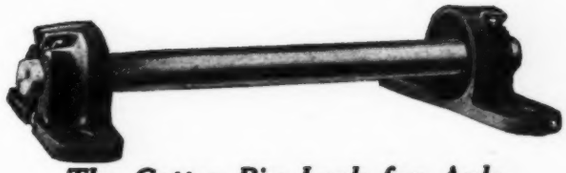
More work per man—less repairs and longer life spell **Economy.**

For these reasons Sterling Wheelbarrows are the universal favorites among the contractors—and the workmen too.

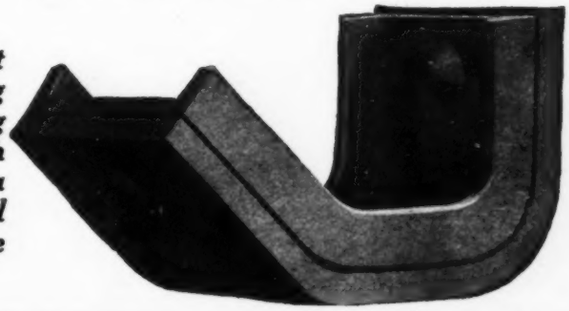
"Ask the man who pushes one"
or write to us for full details



The Clamped On Handles



The Cotter Pin Lock for Axle



Flat Leg Bearing with Extra Steel Shoe

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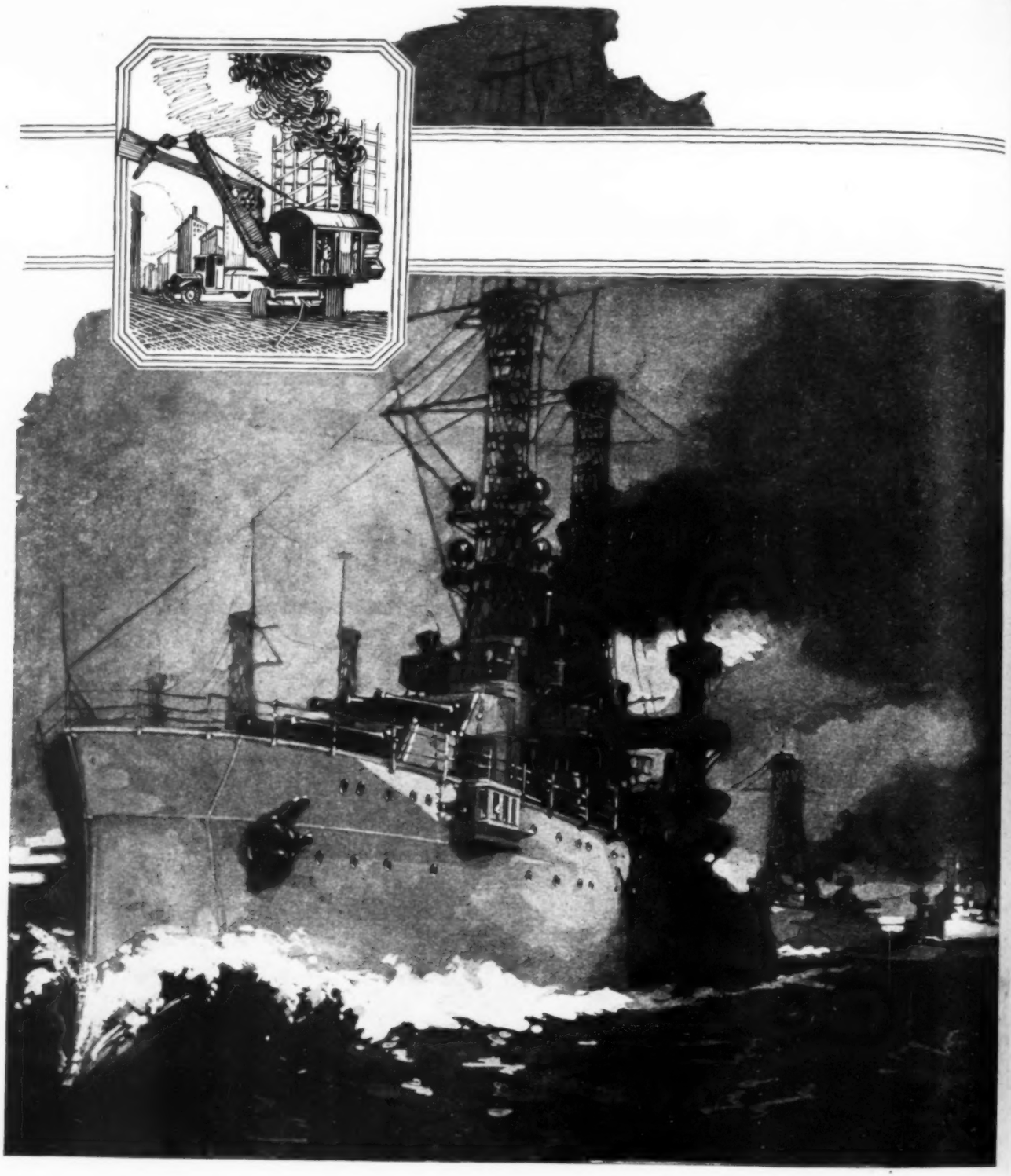


The

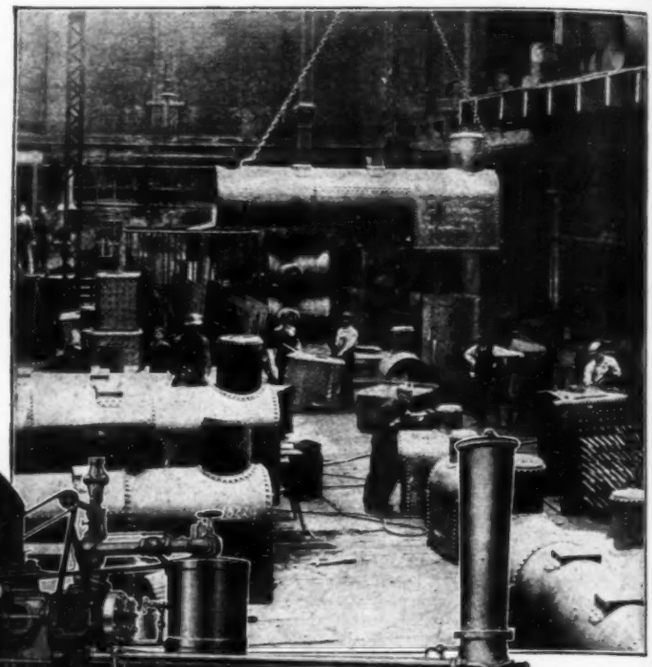
Service

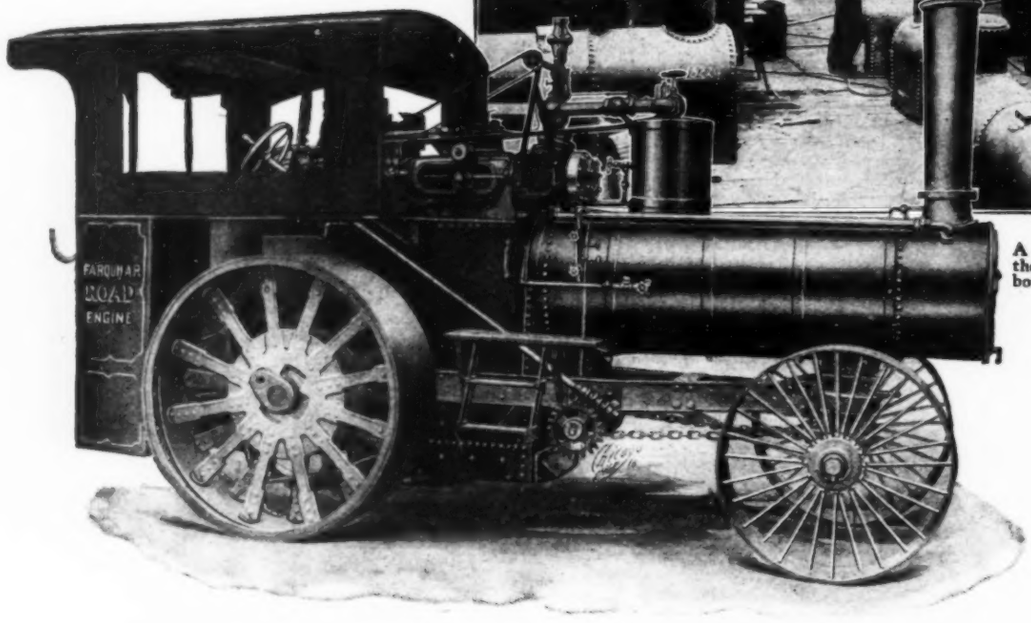
ACROSS the broad pages of history, the United States Navy has written the record of an exceptional *Service*.

Today The Thew Shovel Company is rendering to Power Shovel Owners a *Service* that is exceptional in its concept and completeness. From the purchase of materials down along the line of design, construction, delivery, and expert advice during the entire life of the shovel; *Service* is the potent factor that makes the Thew Shovel different, and better than any Power Shovel on the market.

THE THEW SHOVEL COMPANY
Lorain, Ohio

Power Shovels





A corner of the Farquhar boiler shop.

Behind the Farquhar Road Engines

NO machine is better than the design, materials and workmanship used in its construction. Yet it is these factors—often not evident on the surface—that make for real performance and service.

Farquhar Double Cylinder Road Engines—as well as all other Farquhar products are built correctly, soundly and carefully.

Take for example the boiler—made of the best quality of flanged steel in accordance with A. S. M. E. Standard Boiler Code—working pressure 150 pounds—thoroughly tested.

From first to last, Farquhar design, materials and workmanship are *best.*

Write for catalogs. They are yours for the asking.

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Box 478, YORK, PA., U. S. A.

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